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Digital Transformation of Nutrition Documentation in Cyprus: Development and Cross-Sectional Evaluation of a PNDP Electronic Tool within the Nutrition Care Process

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Digital Transformation of Nutrition Documentation in Cyprus: Development and Cross-Sectional Evaluation of a PNDP Electronic Tool within the Nutrition Care Process

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Abstract

Variation in dietetic documentation is reported in the literature, but standardised documentation is described as supporting consistent practice in both manual and electronic formats. In Cyprus, nutrition and dietetic professionals (NDPs) work across private and institutional settings, including services within and outside the General Health System (GHS/ΓΕΣΥ). This study examined NDPs' knowledge, perceptions, and implementation of documentation processes and standardised languages, and includes expert validation of a new electronic tool based on the Process for Nutrition and Dietetic Practice (PNDP) (e-ΔΔΔΦ).

A pragmatic multiphase research philosophy was used to support a mixed-methods design. Two online questionnaires were administered. Phase 1 included a questionnaire that was self-developed by the research team and was informed by the conceptual structure of the Nutrition Care Process (NCP) as defined by the Academy of Nutrition and Dietetics, including its four-step model (Assessment, Diagnosis, Intervention, Monitoring and Evaluation) and structured diagnostic reasoning principles (Academy of Nutrition and Dietetics, 2013; Swan et al., 2017). Additional guidance was drawn from the PNDP framework issued by the British Dietetic Association (BDA), which operationalises NCP logic within European practice contexts. European professional documentation harmonisation principles disseminated by the European Federation of the Associations of Dietitians (EFAD) were also considered. It collected demographics and information on awareness and use of documentation processes (DPs) and standardised languages (SLs), perceived benefits and drawbacks, and implementation challenges. Questionnaire 2 assessed expert views on the electronic PNDP tool, rating relevance, clarity, and simplicity on a 1–5 scale and collecting open comments. Recruitment was conducted through the Cyprus Nutrition and Dietetic Association (CyDNA) and social media (email, Facebook, Instagram) using a survey link and QR code. Participants self-selected after confirming eligibility and providing informed consent.

Quantitative data were prepared from Google Forms exports and analysed in SPSS (v27). Descriptive statistics were reported. Associations between categorical variables were tested using Fisher's Exact test. For larger contingency tables, Fisher–Freeman–Halton exact tests were used, with Monte Carlo estimation (10,000 samples; 99% confidence interval) when exact computation was not feasible. Effect sizes were assessed using Cramer's V. Multiple-comparison control used Bonferroni (in SPSS) or Benjamini–Hochberg adjustment (in Excel), with a monotonicity step applied. Open-ended responses were coded into themes, converted to numerical variables where appropriate, and analysed descriptively as multiple-response sets.

Phase 1 questionnaire was completed by 63 NDPs, below the planned sample size (n=218). Results were interpreted cautiously where inferential testing was used. Respondents were mostly early-career (mean age 27.4 years; mean practice experience 9.6 months). Most reported practising in Nicosia or Limassol and working in independent private practice. Awareness of at least one DP was reported by 98.4% of participants. PNDP was the most commonly reported DP used in practice (68.3%). Most PNDP users reported implementing all stages. When difficulty was reported, nutrition diagnosis and intervention were the steps most often identified as challenging.

Qualitative findings indicated that the main perceived benefits of SL use were improved communication and clearer documentation, followed by structure and consistency and perceived improvements in care. The main reported drawbacks were time required to complete documentation and the need for training, with additional concerns about workflow disruption. Expert validation (n=7) rated the electronic PNDP tool positively for relevance, clarity, and simplicity. Expert comments focused on improving visual readability, making minor wording changes, and adding clinical fields (e.g., current weight and date fields).

Overall, the findings indicate high awareness and reported use of standardised documentation among this sample, with reported barriers linked mainly to time and training requirements. Expert feedback supported the usability of an electronic PNDP format with targeted interface and content refinements.

Keywords: Nutrition documentation; Standardised language; PNDP; Nutrition care process; Dietetics; Mixed-methods; Cyprus; Implementation; Clinical reasoning; Usability; Expert validation; CHERRIES

Dedication

This thesis is dedicated to my family. To the father of my child, for his continuous support, patience, and encouragement throughout this journey. To my beautiful baby boy, who is only five months old and already beginning to discover the world, first through our eyes, and soon through his own. To my parents, whom I deeply admire for their ethics, strength, and desire to keep learning from everything life teaches us. Finally, I dedicate this work to my sister and the baby she is carrying, a dedication that for me serves as a personal reminder of the meaningful changes this past year has brought to both our lives.

Acknowledgements

I would like to express my sincere gratitude to all those who contributed to the completion of this thesis.

Their feedback and recommendations were valuable to the refinement and evaluation of the tool.

I would like to express my special appreciation to my main supervisor Prof. Eleni Andreou, for her consistent support throughout the research process. Her time, availability and careful guidance were essential at every stage of the work. Her detailed feedback and constructive approach supported both the quality of this study and my development as a researcher. I am sincerely grateful for her encouragement and the energy she brought to the supervision process.

Finally, large language-based tools were used exclusively for proofreading and language refinement. All intellectual content, including interpretation of the results, analyses and discussion, were developed independently by myself.

Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Nicosia. This thesis has been composed solely by myself except where stated otherwise by reference or acknowledgment. It has not been previously submitted, in whole or in part, to this or any other institution for a degree, diploma or other qualifications.

Signed …......……….. Date ……...………………

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Abbreviation Index

BDA	British Dietetic Association
CCPS	Clinical Care Process
CDP	Clinical Documentation Process
CHERRIES	Checklist for Reporting Results of Internet E-Surveys
CN	Clinical Nutrition
CPWS	Clinical Pathways
CyDNA	Cyprus Dietetic And Nutrition Association
CyRBFSTD	Cyprus Council For The Registration Of Food Scientists, Technologists And Dietitians
EBP	Evidence-Based Practice
EHR	Electronic Health Records
EMR/EHR	Electronic Medical/Health Records
EPA	European Pathways Association
ESPEN	European Society For Clinical Nutrition And Metabolism
GHS	General Health System
KDA	Korean Dietetic Association
MN	Medical Nutrition
MNT	Medical Nutrition Therapy
NA	Nutritional Assessment
NCP	Nutrition Care Process
NCPT	Nutrition Care Process Terminology
NDA	National Dietetic Association
NDPs	Nutrition And Dietetic Professionals

PAS	Problem, Aetiology, Symptoms
PICOS	Population, Intervention, Comparison, Outcome, Study Design
PNDP	Process For Nutrition And Dietetic Practice
RO	Research Objective
RQ	Research Question
SL	Standardised Language
SNOMED CT	Systematised Nomenclature of Medicine – Clinical Terms
UREC	University Research Ethics Committee

CHAPTER 1 INTRODUCTION

1.0 Introduction

Advancements in the field of clinical dietetics necessitate structured, evidence-based tools that promote standardised documentation, critical reasoning, and interprofessional communication. In healthcare literature, structured approaches to patient management may be described using terms such as clinical care processes (CCPs) or clinical pathways (CPWs). However, these constructs differ conceptually from professional documentation frameworks such as the Nutrition Care Process (NCP) and the Process for Nutrition and Dietetic Practice (PNDP). Clinical pathways are typically multidisciplinary, diagnosis-based system tools, whereas NCP and PNDP are profession-specific clinical reasoning and documentation frameworks used by dietitians. The European Pathways Association (EPA) which was formed in 2004, has supported the development and implementation of national and software-based health systems including clinical pathways, since 2018 (Rotter et al., 2019).

The PNDP, which is conceptually aligned with the broader NCP, was introduced by the British Dietetic Association (BDA) in 2006 and serves as a professional framework within the nutrition and dietetic community. The PNDP was systemically proven to help mitigate clinical errors and related costs, negative patient outcomes, practice variations as well as prevent health inequities, by encouraging structured and evidence-based interventions. Frameworks such as the PNDP and NCP are supported by standardised language systems, including the Nutrition Care Process Terminology (NCPT) (Swan et al., 2017), as well as broader clinical coding systems such as the Systematised Nomenclature of Medicine – Clinical Terms (SNOMED CT) (BDA, 2021) (Table 1.0).

Table 1.0: Conceptual Relationship between Clinical Pathways, Professional Frameworks and Standardised Language

Level	Construct	Function
System-Level	Clinical Pathways (CPWs)	Multidisciplinary, diagnosis-driven care coordination
Professional-Level	NCP (USA), PNDP (UK)	Dietetic clinical reasoning and documentation framework
Terminology-Level	NCPT, SNOMED CT	Standardised vocabulary supporting documentation

Documentation processes in healthcare serve not only as legal and professional records but also as cognitive tools that structure clinical reasoning and decision-making (Lacey & Pritchett, 2003). The incorporation of standardised terminology within these processes enhances semantic consistency, facilitates data interoperability, and enables outcome evaluation at system level (Swan et al., 2017). Therefore, documentation and terminology function interdependently but represent distinct conceptual layers within clinical practice.

The NCP and NCPT were adopted by different countries around the globe, making them key starting points for data collection and systematic reports (Atkins et al., 2010). For example, in 2012, the Korean dietetic association (KDA) translated NCP/NCPT into Korean and along other academic societies, assisted the Korean Society of Hospital Dietitians and other local organisations in providing educational workshops on NCP/NCPT, which is now an essential component of Korea's dietetic practice curriculum (Kim & Baek, 2013).

Nonetheless, many nutrition and dietetic professionals (NDPs) resist adoption of such documentation processes, leading to their ineffective or inconsistent implementation across the different health settings. Countries that have not yet implemented or officially introduced a structured nutrition assessment process as part of their standards of practice, such as Greece and Cyprus, can benefit from the available literature that explores implementation strategies and associated outcomes from other countries (Corado & Pascual, 2008). This study addresses this gap through the development and evaluation of an electronic PNDP-based tool, tailored for dietetic professionals in Cyprus.

1.1 Background and Rationale

Patients with acute or chronic disease should undergo nutritional status evaluation. This includes nutrition focused physical examination, biomarker evaluation, medical history collection, as well as collection of any information relevant to present nutrition habits or status of health. This information is gathered by clinical dietitians, during a nutritional assessment (NA) screening. The NA addresses insufficiencies or surpluses in a patient's nutrition profile, which may play a key role in the treatment or management of their disease. Completing an NA, can contribute to reductions in overall negative healthcare related variables (hospitalisation time, healthcare related expenses, self-care autonomy, short or long-lasting complications etc.) (Ferrie, 2020). Clinical dietitians are trained healthcare professionals who use NA to apply their clinical knowledge and critical thinking within a structured documentation process, to provide an appropriate nutrition care plan that reflects high quality therapy.

According to the European Society for Clinical Nutrition and Metabolism (ESPEN), as described by Freijer et al. (2019), clinical dietitians can offer medical nutrition (MN) or clinical nutrition (CN) care plans. Medical nutrition includes the prescription of medically supervised nutrition products, such as enteral or parenteral nutrition, to correct a depleted nutrient profile of a patient. Whereas CN encompasses the correction or management of an individual's nutritional status, through careful diet manipulation or modification, when micro- or macro-nutrient needs are increased or reduced, due to acute or chronic metabolic alterations (Freijer et al., 2019).

Both forms of nutrition intervention require critical thinking, evidence-based practice, and prior NA. These fundamental procedures can be incorporated into a simple and effective checklist, or what is formally known as clinical documentation process (CDP). Within the field of nutrition and dietetics there are several documentation process models or frameworks available. These processes and their respective terminologies are presented in Table 1.1. Terminology refers to a set of established terms used to describe characteristics relevant to the delivery of medical treatment and medical or clinical nutrition therapy, and its use should be precise and aligned with the intended definitions (Vivanti et al., 2018). The PNDP is based on the principles of the NCP, and both frameworks embed the ABCDE framework as part of their nutrition assessment step. In 2000, the British Dietetic Association incorporated the PNDP into the learning outcomes as those are specified by the British Board of Dietitians, and in 2007 into the competency standards as those are published by the Health and Care Professions Council. Specifically, the BDA in their latest report for the PNDP, states that the framework does not intent to limit the professional autonomy of the dietitians, but to support their skills, improve their quality of practice and to demonstrate the importance of dietetic input, to other professionals (BDA, 2021).

Table 1.1: Documentation Processes and their Terminology.

Documentation Process / Framework	Terminology	Organisation / Association	Year of introduction
Nutrition Care Process (NCP)	Nutrition Care Process Terminology, later updated to International Dietetic and Nutrition	Academy of Nutrition and Dietetics – American Dietetic Association	2000s

	Terminology (available online)		
Process for Nutrition and Dietetic Practice (PNDP) – renamed to Model and Process for Nutrition and Dietetic Practice	Systematised nomenclature of human medicine – clinical terms (SNOMED CT) (available in spreadsheets)	British Dietetic Association (BDA, 2021)	2006
SOAP notes	No specific terminology recommended	Larry Weed (Podder et al., 2025)	1950s-1960s
ABCDE framework (Anthropometry, Biochemistry, Clinical signs, Dietary history, Environmental and Economic factors)	No specific terminology recommended	Academy of Nutrition and Dietetics – American Dietetic Association via NCP (Zambrano-Villacres et al., 2026)	
International classification functioning, disability and health (ICF) for dietetics (ICF-Dietetics/ ICF-D),	Based on International Statistics Classification of Diseases & Related Health Problems (ICD-10)	World Health Organisation (WHO, 2002)	2001

Other reported benefits of using a documentation process and its associated standardised language (SL), as reported across healthcare professions, include clear description of health status and support for a structured, rational clinical reasoning approach. The use of a DP along with SL reduced variability in clinical practice and enabled clear and consistent record keeping. Additionally, improving communication among healthcare professionals enables interprofessional collaboration, leading to transparency across treatment teams and prevents repetition of effort (Abdelrahman & Abdelmageed, 2014; Mann & Williams, 2003; Zegers et al., 2011). Collectively, these benefits contribute to improved quality of care, and ensure equity and equality in health, decrease patient care associated costs, mitigate errors in clinical practice and improve patient outcome (Guzmán-Leguel & Rodríguez-Lara, 2025).

In dietetic practice, DPs and SLs facilitate the development of specific, measurable, achievable, realistic, and time-bound (SMART) nutrition goals and support the prescription of appropriate, evidence-based and individualized nutrition interventions. Furthermore, DPs and SLs function as tools for the systematic collection of meaningful and measurable data to monitor patient outcome in relation to current medical nutrition therapy (MNT), enabling timely evaluation and modification of nutrition care plans (Alkhaldy et al., 2020; Hakel-Smith & Lewis, 2004; Kim & Baek, 2013).

As healthcare systems increasingly transition towards digitalised health record, the integration of standardised DPs and SLs may further enhance patient care quality and support the evaluation of clinical standards and practices, with patient care quality serving as a key outcome measure (D'Amore et al., 2021).

1.2 Filling a national gap in Cyprus

In Cyprus, nutrition and dietetic practice operates within an evolving regulatory and health system context, while structured documentation remains uneven and digitally unsupported. National initiatives linked to the General Health System (GHS) include specific documentation expectations, such as mandatory anthropometric reporting within health records and PNDP-related documentation requirements when requesting approval for additional patient visits (CYQAA, 2025; Ministry of Energy, 2020). At the same time, access to a validated electronic tool for structured nutrition documentation has not yet been established, and existing electronic notes are often entered in free-text formats with limited structure. System capabilities for dietitians also remain limited than those available to other healthcare professionals. The absence of routine quality-of-care data and the emphasis on financial and regulatory compliance further reduce opportunities for systematic monitoring (Theodorou et al., 2025).

1.3 Problem Statement

Despite the widely recognised benefits of using standardised documentation processes and electronic health record systems, there are currently no validated electronic tools for nutrition care in Cyprus. Clinical dietitians operate within the General Health System (GHS/ΓΕΣΥ) which has integrated electronic health records, but with limited access to patient information and restricted capabilities for structured record-keeping within the GHS's electronic system. This limitation undermines the visibility and integration of dietitians' contributions to patient care and diminishes their ability to influence clinical outcomes effectively.

Standardised languages and documentation processes such as the PNDP, provide a critical framework for structured clinical reasoning, assessment and intervention in MN and CN. They enable the formulation of SMART nutrition goals, support evidence-based interventions and facilitate consistent monitoring of patient outcomes. Nevertheless, the implementation of PNDP and other SLs is often inconsistent or overlooked. Contributing factors include insufficient training, time constraints, lack of appropriate documentation tools, suboptimal healthcare management, and limited awareness of such frameworks, particularly in contexts where healthcare resources are constrained.

Although frameworks such as the PNDP and its counterpart NCP, have been shown to enhance the quality of dietetic practice, professional productivity, and patient outcomes, their practical application is frequently perceived as complex and time-intensive (Kim & Baek, 2013; Lovestam, Steiber et al., 2019). For instance, 23% of dietitians in Saudi Arabia reported challenges in implementing the NCP in routine practice (Alkhaldy et al., 2020). In addition, the inconsistent or incorrect use of standardised terminology can reinforce perceptions of documentation as burdensome or clinically unhelpful (Freijer et al., 2019; Vinci et al., 2023).

Collectively, these challenges reveal a critical gap: the absence of a user-friendly, efficient and context-appropriate electronic platform or tool, for consistent nutritional documentation, outcome evaluation and interdisciplinary communication. This gap hinders the integration of dietitians into multidisciplinary healthcare teams and limits the ability to deliver high-quality, patient-centred care. Addressing this gap is essential to strengthening dietetic practice, improving patient outcomes and facilitating the digital transformation of nutrition care in Cyprus.

1.4 Research Aim

The overarching aim of this PhD study was to examine the implementation of structured documentation processes in dietetic practice in Cyprus and to develop and evaluate, through expert validation, a context-specific electronic PNDP tool designed to enhance documentation consistency, strengthen the transparency of clinical reasoning, and support the quality and sustainability of dietetic care within the Cypriot healthcare system.

1.5 Research Objectives

To address this primary aim, the study pursued the following objectives:

1. To assess current documentation practices among nutrition and dietetic professionals in Cyprus, including awareness and use of documentation processes and structured language, with particular focus on PNDP.

2. To explore professional perceptions regarding the value, feasibility, barriers, and facilitators associated with structured documentation within the Cypriot healthcare system.

3. To identify organisational, technological, educational, and practice-related factors that may influence the adoption and longer-term integration of structured digital documentation.

4. To develop a context-specific electronic PNDP tool informed by local practice needs and implementation challenges identified through the first study phase.

5. To evaluate the expert-perceived relevance, clarity, and simplicity of the electronic PNDP tool, alongside qualitative feedback on its usability, workflow fit, and practical acceptability.

1.6 Research Hypotheses

Where quantitative comparisons were conducted, the study tested the following hypotheses:

- H1: Current documentation practices are not consistently standardised or auditable among nutrition and dietetic professionals in Cyprus.

- H2: Structured documentation framework use, with particular focus on PNDP, is associated with more consistent documentation and clearer clinical reasoning.

- H3: The electronic PNDP tool will receive positive expert evaluation in relation to relevance, clarity, simplicity, and practical acceptability.

1.7 Significance of the Study

This study contributes substantively to evidence-based dietetic practice by advancing the structured and digital standardisation of nutrition documentation within a real-world healthcare system. By developing and expert-validating an electronic PNDP-based tool tailored specifically to the Cypriot healthcare environment, the research addresses a critical infrastructural and professional gap where no formally validated digital nutrition documentation framework previously existed. In doing so, it moves beyond theoretical endorsement of standardised frameworks and provides an applied, operational solution adaptable to routine clinical practice.

At the clinical level, the study supports improved quality, consistency, and transparency in dietetic documentation. Structured digital documentation enhances clinical reasoning, facilitates continuity of care, and promotes clearer communication within multidisciplinary teams. By embedding standardised processes into a user-friendly electronic format, the tool has the potential to reduce variability in practice, improve documentation completeness, and strengthen patient-centred care delivery.

At the professional level, the research reinforces the visibility and accountability of dietitians within integrated healthcare systems. Standardised electronic documentation enables clearer articulation of nutrition diagnoses, interventions, and outcomes, thereby strengthening the professional identity of dietitians and their measurable contribution to patient management. This has implications for professional recognition, interprofessional collaboration, and service evaluation.

At the educational level, the electronic PNDP tool offers a structured framework that can support undergraduate and continuing professional development (CPD) training. By operationalising the steps of the NCP in a digital environment, it provides a practical learning scaffold that may enhance clinical reasoning skills, diagnostic confidence, and competency development among future practitioners.

At the health system and policy level, the study contributes evidence to inform national initiatives regarding digital health integration and professional standardisation. The findings may guide policymakers and professional bodies in establishing clearer documentation standards, facilitating interoperability with electronic health records (EHRs), and supporting compliance with regulatory frameworks, including data protection legislation such as the General Data Protection Regulation (GDPR). The structured data generated through such systems may also enable future audit processes, quality improvement initiatives, and health services research.

From a research perspective, this study contributes to the emerging field of implementation science in dietetics by examining not only awareness or attitudes towards standardised frameworks, but also the practical and contextual dynamics of structured digital documentation implementation. By situating its findings within a digitally evolving healthcare system, the research provides transferable insights relevant to other small or resource-constrained health systems undergoing digital transformation.

Ultimately, this work aims to enhance the quality, consistency, and efficiency of dietetic care in Cyprus while offering a context-sensitive model for integrating structured nutrition care processes into modern healthcare infrastructures. Its significance lies not only in tool development, but in advancing the digital maturation and professional standardisation of dietetic practice.

1.8 Innovation and Originality of the Study

The originality of this study lies in its comprehensive and system-oriented examination of standardised nutrition documentation through the lens of digital transformation in dietetic practice. While previous research has predominantly focused on awareness, attitudes, or isolated implementation barriers associated with the Nutrition Care Process (NCP) and its related terminology, the present study advances the field by moving beyond descriptive analysis toward applied development, contextualised evaluation, and implementation-focused interpretation.

First, the study contributes methodological originality through the development and expert evaluation of a context-specific electronic PNDP-based documentation tool tailored to the Cypriot healthcare system. Unlike generic electronic health record templates, this tool was purpose-built to operationalise the PNDP framework, embedding structured reasoning prompts, terminology alignment, and workflow-oriented considerations within a digitally constrained environment. The inclusion of expert validation, assessment of practical acceptability, and qualitative feedback strengthens the rigour of the development process and provides applied evidence of feasibility in a context where validated electronic nutrition documentation tools are not currently available.

Second, the study integrates quantitative and qualitative methodologies to capture both measurable indicators of implementation (e.g., awareness, use patterns, perceived barriers, and expert ratings) and experiential dimensions of practice (e.g., workflow fit, professional perceptions, and the perceived value of structured documentation). This mixed-methods approach allows for a multidimensional understanding of implementation dynamics, linking documentation practice with organisational context and early-stage digital tool development.

Third, the research offers a novel contextual contribution by situating structured nutrition documentation within the Cypriot healthcare system, where no validated electronic PNDP tool previously existed. By examining implementation within the General Health System (GHS/ΓΕΣΥ) and the wider local practice environment, the study generates context-specific evidence relating to regulatory, infrastructural, educational, and professional constraints. In this respect, it provides a relevant model for other small or digitally evolving healthcare systems facing similar limitations.

Finally, the study contributes to implementation science in dietetics by conceptualising documentation not merely as record keeping, but as a mechanism for strengthening consistency, enhancing the visibility of clinical reasoning, and supporting future quality improvement. Through its examination of current documentation practices and the early evaluation of a structured electronic PNDP tool, the study extends standardisation frameworks into a practical digital context while remaining attentive to the conditions required for adoption, including training, workflow fit, and system readiness.

In summary, the originality of this study resides in its integration of conceptual clarification, Cyprus-specific implementation evidence, digital tool development, and early-stage expert evaluation. It advances the discussion from awareness of structured terminology toward context-sensitive digital support for structured nutrition care, positioning dietetic documentation within broader conversations on health informatics, professional standardisation, and healthcare quality improvement.

1.9 Conclusion

The introduction establishes the foundation of the research by presenting the background, rationale and the specific problem statement regarding dietetic practices and use of documentation process models and standardised language. It introduces the primary research aim, objectives and hypotheses that drive the study. The following chapter, provides a comprehensive literature review, exploring the theoretical foundations of the role of standardised documentation. This section specifically examines digital tools and electronic health systems internationally, intending to highlight the current gaps at a national level. Chapter 3 details the research methodology and procedure, outlining the study design, methods of participant recruitment, data collection and handling as well as the ethical considerations accounted for their collection and analysis. The findings of the study are presented in Chapter 4, detailing the thematic or statistical results derived from the data collected. To support the findings of the study figures and tables were also used. Finally, Chapter 5 provides a discussion of these results in relation to existing literature, addresses the study limitations, comments on practical implications for the dietetic profession and provides recommendations for future research.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

As explicitly stated in the BDA's report titled "Model and Process for Nutrition and Dietetic Practice (BDA, 2021), and cited in relevant publications (Lindop & McClinchy, 2016), the PNDP is conceptually grounded in the principles and structural logic of the NCP, with both frameworks aiming to enhance the quality, consistency, transparency, and accountability of nutrition care through a standardised, stepwise model of clinical reasoning and documentation, given their structural alignment. Both processes, PNDP and NCP organise practice into defined phases—assessment, diagnosis, intervention, and monitoring— seeking to reduce variability in practice and support auditable, evidence-informed decision-making.

Given their conceptual equivalence, literature focusing on the NCP can also be considered highly comparable to PNDP-related practice. That is, despite the growing incorporation of PNDP into professional standards and regulatory guidance, empirical research explicitly examining PNDP implementation remains limited (Lindop & McClinchy, 2016). Consequently, much of the existing evidence informing PNDP-related practice is derived from studies investigating the implementation of the NCP and its associated standardised terminology (NCPT). Therefore, findings from NCP-focused research provide a relevant and necessary evidentiary foundation for understanding trends, barriers, facilitators, and format-related challenges associated with PNDP implementation. Nonetheless, such extrapolation requires careful contextual consideration, particularly in health systems where digital infrastructure and professional governance structures differ from those in which most NCP research has been conducted.

This chapter establishes the theoretical and empirical foundation for the present study. It synthesises literature on evidence-based dietetic practice, clinical reasoning frameworks, standardised terminology, digital documentation systems, and implementation dynamics. Particular attention is given to methodological limitations and unresolved conceptual issues in the literature, as well as to contextual gaps within the Cypriot healthcare system. Through this critical examination, the chapter identifies the conceptual, methodological, and contextual rationale underpinning the research design presented in Chapter 3.

2.1 Systematic Review of Manual and Software-Based Implementation of the Nutrition Care Process

2.1.1 Overview and Rationale

To establish a comprehensive evidence base for examining manual and software-based implementation of structured nutrition documentation, a systematic review was conducted as part of this doctoral research. The review aimed to synthesise international evidence on the adoption of the NCP and NCPT, with particular emphasis on differences between manual (handwritten or typed free-text) and electronic or software-integrated formats.

While previous literature has examined awareness and general adoption trends of the NCP, limited synthesis had explicitly compared documentation format as a potential determinant of implementation outcomes. The systematic review therefore sought to identify patterns of uptake, regional variations, and the structural factors influencing successful integration of structured nutrition documentation.

2.1.2 Methodological Approach

The systematic review was written in the form of an article, which was submitted for publication to the journal *Nutrients*, under the title "Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings".

The review was conducted in accordance with PRISMA guidelines (Figure 2.0) and was registered in PROSPERO (CRD420261279775). Its primary aim was to synthesise international evidence regarding the implementation of the NCP and Nutrition Care Process Terminology (NCPT), including implementation barriers and enablers, as well as the differences in implementation between manual (paper-based or typed) and electronic or software-integrated formats.

The methodology was guided by a clearly defined the Population, Intervention, Comparison, Outcomes and Study Design (PICOS) Framework (Table 2.0). The review included observational study designs, cross-sectional, cohort, qualitative, pilot and mixed-methods studies, examining registered dietitians and accredited nutrition professionals. Searches were conducted across MEDLINE, EMBASE, and Cochrane databases, covering publications from 2009–2024.

Table 2.0: The Population, Intervention, Comparison, Outcomes and Study Design Framework.

Component	Description
P (Population)	Registered dietitians and nutrition professionals across clinical, public health, or academic settings.
I (Intervention)	Use of the Nutrition Care Process in manual format (handwritten or typed documentation).

C (Comparison)	Use of the Nutrition Care Process in an electronic or software-based format (e.g., EHR-integrated systems).
O (Outcomes)	Time efficiency, quality of documentation, professional satisfaction, and patient health outcomes.
S (Study Design)	Observational studies including cross-sectional, cohort, mixed-methods, or qualitative focus group designs.

The graphical abstract presented in figure 2.1, provides a preview of the methodology and key findings around factors influencing implementation of the NCP such as training, peer support, institutional endorsement, and technological infrastructure. Importantly, in studies where electronic integration of the NCP within EHR systems was adopted, findings suggested:

- Higher implementation rates
- Improved documentation quality
- Greater practitioner confidence
- Enhanced workflow efficiency
- Conversely, manual or handwritten implementation was frequently described as time-consuming and difficult.

Overall, Table 2.1 functions as a formal overview of the submitted manuscript, outlining its scope, objectives, methodological framework, and key conclusions. The systematic review establishes the international evidence base for examining format-based differences (manual vs. electronic NCP use), thereby providing the empirical and conceptual foundation for the present doctoral study focusing on digital implementation within the Cypriot healthcare context.

Figure 2.0: PRISMA flow chart of study selection process.

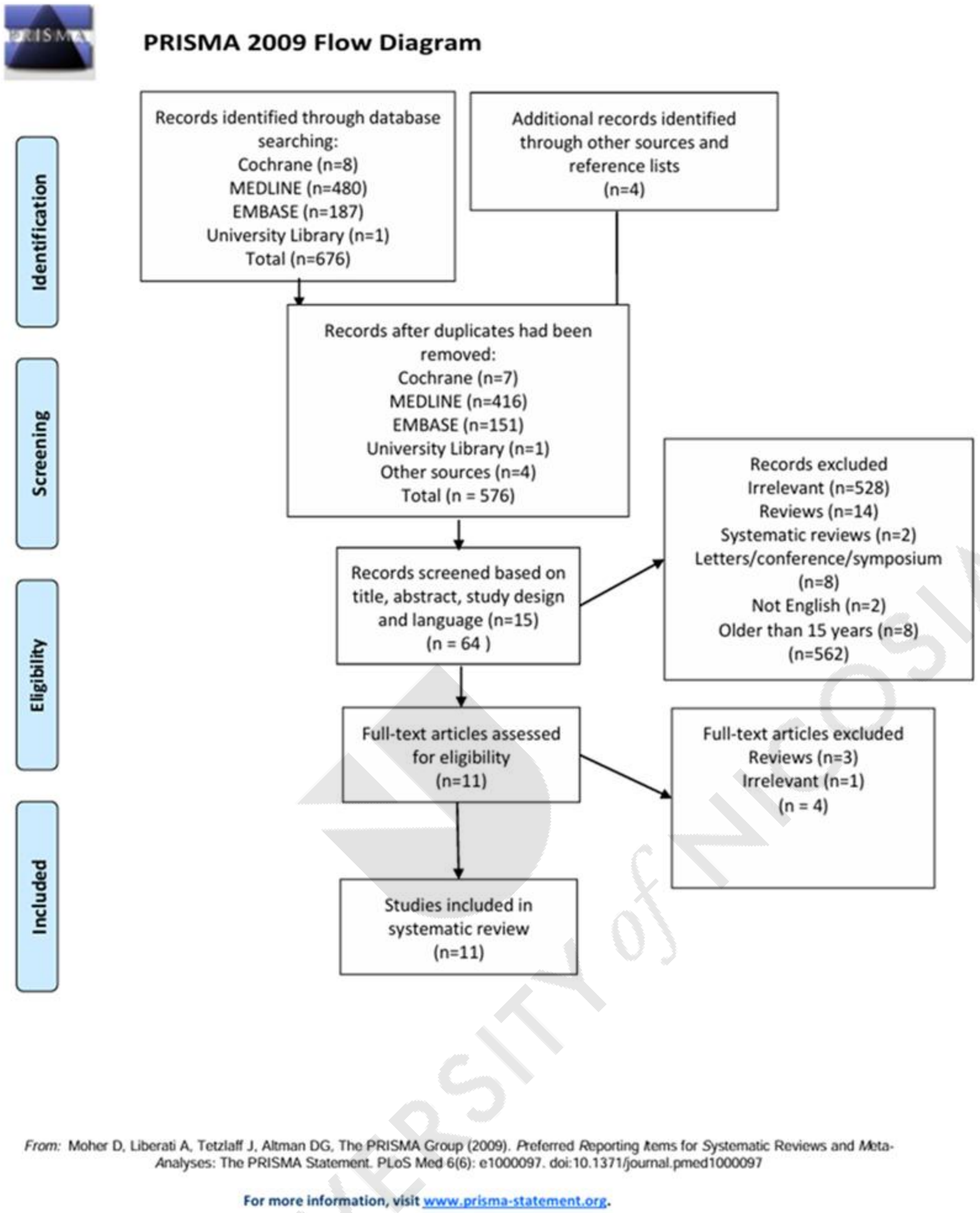

Figure 2.1: Graphical Abstract of the Submitted Systematic Review

Table 2.1: A preview of the systematic review that was submitted for publication

Review

Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings.

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Abstract

The Nutrition Care Process (NCP) is a standardised model aimed at improving the quality and consistency of nutrition care. Its practicality and applicability vary, based on factors such as time-efficiency, workforce enforcement, peer support, technological infrastructure and more. This study aims to collect the evidence around these trends and attitudes and form recommendations for future research. **Objectives**: The Objectives of this review are to identify and present the trends around implementation of the NCP/NCPT and to examine the factors influencing these trends. **Methods**: The methodology follows the PRISMA guidelines and includes studies published between 2009 and 2024, that were written in English or Greek and were peer-reviewed. The studies were assessed for their study design quality using the National Heart, Lung, and Blood Institute (NIH). **Results**: Limited training and technological infrastructure are strong discouraging factors for implementation. Support from NDAs, peer collaboration, and access to EHRs were strong encouraging factors for implementation. When EHRs integrated the NCP, in full or in part, implementation rates were higher and were associated with better documentation quality, more practitioner confidence, and increased workflow efficiency. When NCP/NCPT was used for hand-written notes, it was often associated with a time-consuming and difficult activity. **Conclusions**: The integration of the NCP in digital platforms seems to be an effective and reasonable act towards improving patient care. It seems to help compliance with protocols and frameworks, therefore leading to better patient outcome. Systematic review registration: PROSPERO CRD420261279775 .

Keywords: Clinical Nutrition; Medical Nutrition Therapy; Health education; Nutrition care; nutrition education

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1. Introduction

Standardisation refers to the adoption of protocols, frameworks, guidelines and relevant terminology available for clinical practice to ensure consistency. The development of clinical care processes (CCP) is dating back to the early years of medicine. Since then, the information included in those CCPs is continuously updated, leading to confusion or availability of fragmented information and finally, resistance for implementing of such CCPs. Therefore, variation in clinical treatment plans persists, not only between individual health care professionals' (HCPs), but also within an individual HCP's practice (Lehmann & Miller, 2004). In 2002, the Academy of Nutrition and Dietetics (Academy) initiated an action plan for standardisation of protocols, by introducing the Nutrition Care Process (NCP). In 2012, the Academy decided to include the NCP as a fundamental component of the Standards of Practice (SOP) for dietitians, along with the International Dietetics and Nutrition Terminology (IDNT) know known as the Nutrition Care process Terminology (NCPT). In 2016, the NCP was also included in the competency standards for qualified nutritionists and dietitians, published by the International Confederation of Dietetic Associations (ICDA), which was jointly developed with the European Federation of Dietetic Associations (EFAD) (Academy of nutrition and dietetics: Revised 2012 standards of practice in nutrition care and standards of professional performance for registered dietitians, 2013; International Confederation of Dietetic Associations, 2016).

The NCP was brought forward by these organisations as a tool to assist dietitians in documenting concise and patient-focused health records, to support critical thinking, and increase the rate of guideline compliance – finally leading to a reduction of practice association errors and consequent costs. Later, it was found to also increase the value of nutrition and dietetic professionals as perceived by other HCPs when the NCP was used for patients receiving collaborative care (Swan et al., 2017).

More recently, the format through which the NCP is implemented—manual (paper-based or typed) versus electronic or software-based documentation—has emerged as a critical determinant of adoption. Differences in usability, time efficiency, integration with electronic health records (EHRs), and institutional support may substantially influence implementation success across settings (Swan et al., 2017).

Despite its documented benefits, the implementation of the NCP remains inconsistent globally. This systematic review aims to synthesize existing evidence to inform future research and practice, focusing on the format and implementation of the NCP/NCPT. Specifically, this review seeks to identify trends in NCP/NCPT implementation and examine the factors influencing these trends.

2. Materials and Methods

2.1. Study Selection

This systematic review was conducted in accordance with the PRISMA 2009 guidelines and was registered in PROSPERO (Registration No: CRD420261279775). The eligibility criteria were defined using the PICOS framework (Table 1).

Studies were included if they met all of the following criteria: Published between 2005 and 2024, Available in full text, Written in English or Greek, Original, peer-reviewed research, Focused on the implementation of the Nutrition Care Process (NCP) or Nutrition Care Process Terminology (NCPT), Involved registered dietitians or accredited nutrition professionals from countries without formal registration systems, Employed cross-sectional, cohort, pilot, or qualitative focus group designs.

Studies were excluded if they were: Review articles, conference abstracts, letters, or commentaries, Non-peer-reviewed publications, Animal studies, Focused on unofficial or developmental tools similar to the NCP, Duplicate entries, Lacked direct relevance to NCP/NCPT implementation.

A systematic literature search was conducted in three databases: MEDLINE, Cochrane, and EMBASE, covering publications from 2009 to 2024. Search strategies were developed around the PICOS model and tailored for each database (see Table 1). Two reviewers independently screened all titles and abstracts, followed by full-text review for eligibility. Discrepancies were resolved through discussion and consensus.

2.2. Data Extraction

For each included study, data were extracted independently by two reviewers using a standardized Excel sheet. Extracted information included:

- authorship,
- year of publication,
- country,
- study design,
- sample size,
- characteristics of the intervention (manual or electronic NCP format),
- and key findings related to implementation.

Two researchers (E.P., E.A.) independently extracted data using a standardised Excel spreadsheet. Extracted variables included: authorship, year, country, study design, sample size, NCP format, and influencing factors. Disagreements were resolved through discussion and consensus.

2.3. Quality Assessment

Quality assessment was performed using the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. Each study was rated as High, Medium, or Low quality.

Due to the heterogeneity of methods and outcomes, a narrative synthesis was employed. Descriptive statistics were used where available.

Component	Description
P (Population)	Registered dietitians and nutrition professionals across clinical, public health, or academic settings.
I (Intervention)	Use of the Nutrition Care Process in manual format (handwritten or typed documentation).
C (Comparison)	Use of the Nutrition Care Process in an electronic or software-based format (e.g., EHR-integrated systems).
O (Outcomes)	Time efficiency, quality of documentation, professional satisfaction, and patient health outcomes.
S (Study Design)	Observational studies including cross-sectional, cohort, mixed-methods, or qualitative focus group designs.

Table 1. PICOS framework used in this systematic review.

2.3. Data Synthesis

Given the methodological heterogeneity across the included studies—such as variations in study design, clinical settings, and outcome measures—a narrative synthesis approach was chosen. This approach involved summarizing study findings thematically without statistical pooling or meta-analysis. Descriptive statistics, such as frequencies, percentages, and p-values, were reported where available in the included studies.

3. Results

The PRISMA flow chart (Figure 1) summarizes the study selection process. A total of 11 studies were included in the final analysis after screening, eligibility checks, and removal of duplicates. These studies represent a variety of international settings and healthcare systems. Designs included cross-sectional surveys, cohort studies, qualitative focus groups, and pilot interventions. Sample sizes ranged from 12 to 6498 participants.

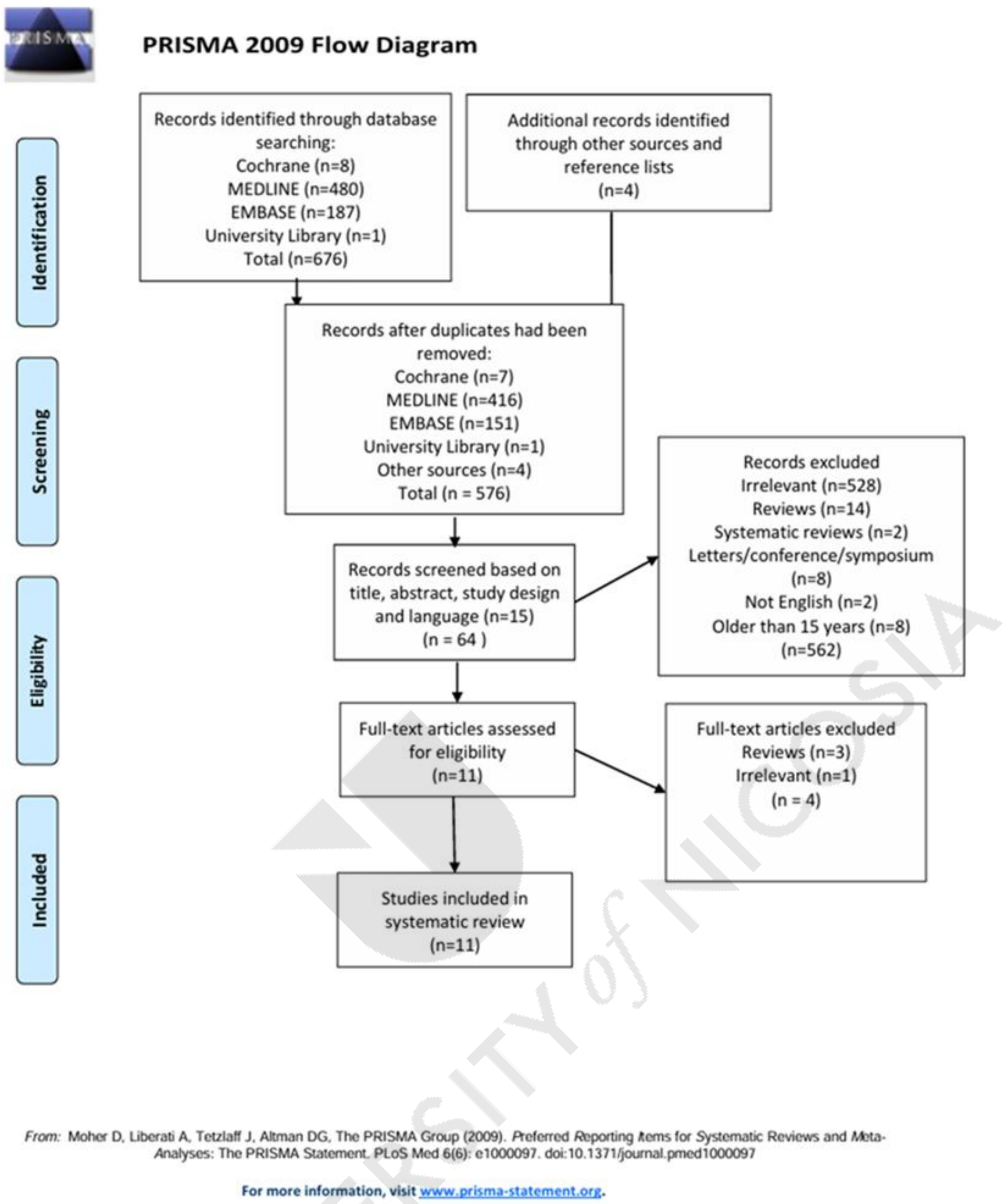


Figure 1. PRISMA Flow Diagram.

3.1. Study Characteristics

The included studies covered diverse regions and practice environments. Data were extracted on country, study design, sample size, implementation format (manual vs electronic), and key findings. These are summarised in Table 2.

Table 2. Summary of Study Characteristics.

Authors	*Country*	*Study Design*	*Sample Size*	*NCP-Format*	*Key Findings*	*Quality**
Alkhaldy et al.(Alkhaldy et al., 2020)	*Saudi Arabia*	*Cross-sectional (quantitative)*	*56 dietitians*	*Manual (Excel use; some informal*	*Majority were aware of NCP but lacked*	*Medium*

				digital methods)	formal training; barriers included lack of experience, inadequate staffing, and protocol conflicts.	
Kim and Baek(Kim & Baek, 2013) *Lovestam et al.(Lovestam, Steiber et al., 2019)*	*South Korea*	*Questionnaire survey*	*35 hospitals*	*Mixed (Manual and Computerised form)*	*Limited full NCP implementation; 21 hospitals plan future adoption*	*Medium*
Lovestam et al.(Lövestam, E. et al., 2020)	*10 countries*	*International cohort (survey)*	*6498 dietitians*	*Mostly manual; NCPT less used*	*NCP used more than NCPT (P<0.001); stronger implementation in inpatient settings; Greece lowest awareness (50%)*	*High*
O'Sullivan, Lo and Vivanti(O'Sullivan et al., 2019)	*10 countries*	*Cross-sectional (validated online survey)*	*5727 professionals*	*Mixed*	*Top barrier: time (39%); top enabler: national dietetic association support (69%); country-specific differences significant*	*High*
	Australia, New Zealand, Singapore	*Online survey*	*377 dietitians*	*Mixed*	*65% currently use NCP; main barriers: lack of time, training, knowledge, and EHR*	*High*

					access; benefit to patient care statistically supported	
Vivanti, Lewis and O'Sullivan (Vivanti et al., 2018)	Australia	Cohort design (2011 & 2014)	218 in 2011, 205 in 2014	Online survey using ASK NCP	Knowledge barrier reduced (P<0.001); improved perceptions of NCP structure, documentation clarity, and care quality	High
Lovestam, Bostrom and Orrevall (Lovestam et al., 2017)	Sweden	Qualitative (focus groups)	37 dietitians	Manual, semi-guided	Independent dietitians struggled without formal support; time pressure and terminology complexity were major issues	Medium
Porter, Devine and O'Sullivan (Porter, J. M. et al., 2015)	Australia	Mixed-methods (with control group)	35 dietitians	Manual vs software and training	Training package increased knowledge, support, and familiarity; barriers: unclear implementation strategy, PES difficulty	High
O'Sullivan (2013) Vinci et al.(Vinci et al., 2023)	Australia	Pilot study (survey, case study, pre-post test)	12 dietitians	Electronic prototype	86% had not used NCP/NCPT due to knowledge gaps; prototype improved speed, accessibility,	Medium

					and documentation clarity	
	Switzerland	*Qualitative (secondary analysis)*	*228 dietitians*	*Mixed*	*99% awareness; key enablers: peer support, EHR, association recommendations; language-based differences observed*	*High*

3.2. Quality Assessment of Included Studies

Each study was appraised using the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. Scores were assigned as High, Medium, or Low. Most studies fell in the medium-to-high quality range. Common limitations included small sample sizes and lack of blinding. The results of the assessment are shown in Table 3.

Table 3. Quality Assessment Summary.

Authors (Ref)	YES	NO	NR	NA	Ap
Porter et al.(Porter, J. M. et al., 2015)	8	5	1	1	
Vivanti, Lewis and O'Sullivan(Vivanti et al., 2018)	10	3	0	1	
Alkhaldy et al.(Alkhaldy et al., 2020)	7	6	1	0	
Kim and Baek(Kim & Baek, 2013)	8	5	1	0	
O'Sullivan, Lo and Vivanti (O'Sullivan et al., 2019)	8	4	2	0	
Lövestam et al.(Lövestam, E. et al., 2020)	8	5	1	0	
Lovestam et al.(Lovestam, Steiber et al., 2019)	12	2	0	0	
Lovestam, Bostrom and Orrevall	9	4	1	0	

(Lovestam et al., 2017)						
Vinci et al.(Vinci et al., 2023)	10	3	1	0	14	71.
Porter et al.(Porter, Jane M. et al., 2015)	9	4	1	0	14	64.
O'Sullivan (2013)	7	4	1	0	12	58.

3.3. Narrative Synthesis of Key Findings

Given the methodological heterogeneity, a narrative synthesis was used without statistical pooling. Descriptive statistics (e.g., frequencies, p-values) were reported where available.

Common enablers identified across studies:

- Support from National Dietetic Associations (NDAs)
- Access to Electronic Health Records (EHRs)
- Peer support or structured mentorship programmes

Common barriers included:

- Lack of formal training or education
- Time constraints
- Limited technological infrastructure

These findings are visualised in Figure 2.

3.4. Multinational Implementation Studies

Lovestam et al.(Lovestam, Steiber et al., 2019) assessed the level of implementation of NCP and NCPT across 10 countries (Australia, Canada, Greece, Switzerland, Ireland, Denmark, New Zealand, the United States, Sweden, and Norway). An online, validated survey was distributed to dietitians across participating countries, where the NCP/ NCPT had been introduced at different timelines, between 2009 and 2014. The survey was composed of four modules, each of which was statistically analysed independently. Only Module 1 (demographic characteristics, n=6459) and Module 2 (NCP/NCPT implementation, n=5255) were discussed in said publication. Sample characteristics differed because of the multinational concept of the study. Differences include sample size variability and the NCP/NCPT implementation strategy applied per country. Participants who reported to be unaware of the NCP were directed to the end of the study and recorded as never using nor planning to use the NCP/NCPT. Although Greece was part of the study, they had not implemented the NCP/NCPT at that time and still have not as of this writing(Chrysoula et al., 2024). Thus, questions related to aspects from Module 3 have been removed from the version of the questionnaire distributed to participants from Greece.

Overall, the NCP was implemented either more frequently or for longer periods than the NCPT ($p < 0.001$). The NCP and NCPT were significantly more likely to be implemented in inpatient settings (81% and 61%, respectively) and in public health settings (54% and 28%, respectively) ($p < 0.0001$).

Module 3 (factors influencing NCP implementation, n=5727) was published as part of a secondary analysis investigating the attitudes, barriers and enablers related to NCP across the 10 countries (Lövestam, E. et al., 2020). A National Dietetic Association (NDA) recommendation was identified as the strongest enabler (69%), followed by peer support (63%) and the availability of electronic health records (EHR) (55%). The magnitude of an NDA recommendation demonstrated significant variation across the participating nations. While 73% of the US participants cited it as determinant, only 44% of the Norwegian dietitians did, suggesting that the preparedness and infrastructural capacity of the NDA to support such directives are crucial for effective implementation. Dietitians in Greece were not asked about the current recommendations by the NDA or about the Lack of training and education relating to the NCP. Overall, the time to implement the NCP was reported as the strongest barrier (39%), followed by inadequate training and knowledge (32%). Variability was observed in the perception of the time-intensive nature of the NCP and its training demands, with 85% and 77% of Norwegian participants, respectively, citing these issues, compared with only 49% and 16% of Australian and New Zealand participants, respectively.

Data collected from Module 3 of the original study by Lovestam et al [15], were re-analysed by Vinci et al.(Vinci et al., 2023), isolating the German and French speaking dietitians in Switzerland. The sample size was reduced to 228 dietitians, representing the 19% of the dietitians in the country in 2012 (n=144 German, n=84 French speaking). Awareness of the NCP/NCPT was almost universal (99%) with frequent use of the two tools by the majority (72%). Peer support and NDA influence were the strongest enablers for NCP/NCPT implementation for both groups. Barriers were similar across both groups, such as time constraints, insufficient knowledge or training, EHR and financial limitations and more. Like previous results, NDA influence varied between German and French speakers (89% vs 77%; $p<0.05$). Other factors with significant variation between the two groups included access to EHR (81% German vs 44% French speakers; $p<0.001$) and workplace NCP use enforcement (75% German vs 53% French speakers; $p<0.05$).

There was significant variation in the rate of implementation between each NCP and NCPT step ($p<0.001$ for each). Country of residence was a significant factor for NCP and NCPT implementation. With the United States as a reference country, all countries excluding Australia, reported a significantly lower level of implementation (New Zealand $p<0.001$; Canada, Switzerland, Denmark, Sweden, Norway, Ireland and Greece $p<0.0001$). These differences likely reflect the chronological order and methods through which NCP/NCPT were introduced, with the US adopting the tools in 2003 and Australia in 2009, whereas Greece has not yet implemented them as of this writing (Chrysoula et al., 2024; O'Sullivan et al., 2019). Level of education did not have a significant impact on implementation ($p=0.253$). Each additional year since completing the dietetic training was associated with a decrease in the implementation rate ($p=0.0001$). Dietitians working with inpatients, outpatients, in teaching-academic areas and in managerial positions had the highest implementation scores

(P<0.0001), compared to those working in the community, research, or not currently working as dietitians. Lower associations between practice settings and implementation rates were seen in consultation and business practice (P=0.007), foodservice (P=0.004), and other (P=0.001), with the lowest from dietitians working in public health (P<0.0001).

A key limitation of the original study, and consequently of its secondary analyses, is that the United States contributed the largest proportion of the sample, which may have skewed the statistical findings. Additionally, only half of the dietitians in Greece were aware of the NCP/NCPT, potentially biasing the results. Future studies should consider more carefully selected samples, considering awareness of the NCP/NCPT as part of the inclusion criteria to enhance comparability across countries and improve generalisability.

3.5. National-Level Insights: Sweden, Australia and New Zealand

Vivanti, Lewis and O'Sullivan(Vivanti et al., 2018) assessed the knowledge about and trends around NCPT, focusing on enabling or disenabling factors and related implementation. The study took place in Australia in two phases (n=218 in 2011 and n=205 in 2014) and included members of the national association. The participants were asked to complete a validated survey. The time-intensive nature of NCP/NCPT was the strongest disabling factor for both surveying years (p=0.84, 40% in 2011 and 41% in 2014). Although there was a significantly higher level of NCP/NCPT knowledge (mean p<0.0175) and improved familiarity with and confidence in using the NCP in 2014 (p<0.001) compared to 2011, the time barrier persisted.

Paradoxically, although participants in 2014 acknowledge the advantages supporting the NCP use (improved interdisciplinary communication, patient care and critical thinking (P < 0.001)) a higher proportion of participants, compared to 2011, still do not see clear benefits in its use. Despite the accepted benefits of NCP, there seems to be a potential disconnect between theoretical advantages and practical experience since its time-expensive process leads to implementation resistance (P=0.002).

O'Sullivan, Lo and Vivanti(O'Sullivan et al., 2019), evaluated knowledge, familiarity and concerns related to NCPT as influencing factors for its implementation in the Asia-Pacific region, using the validated ASK NCP survey. The study was multinational including 377 dietitians, contributing to varying percentages of registered dietitians per locale (n=209, 5% of registered professionals from Australia, n=4, 7% of registered professionals from New Zealand, n=51, 55% of registered professionals from Singapore, and n=4 from Philippines, Indian and USA combined). Across the countries, 81.7% of the participants consider the NCP applicable to their practice, but only 65.1% currently use it. The NCP and IDNT is perceived as a useful tool for improving patient care (55%) but as inconvenient to implement (19.6%). Lack of training and support, and insufficient time, were the most reported reasons for resisting implementation of the NCP, each cited by 25.5% of respondents, followed by lack of knowledge (23.8%).

A secondary analysis of seven semi structured audiotaped focus groups (n-=3-8 per group) was conducted by Lovestam, Bostrom and Orrevall(Lovestam et al., 2017), to document the experiences and factors related to NCP/NCPT implementation of 37 dietitians, across 13 workplaces in Sweden. The participants were familiar with the NCP/NCPT, with at least one year of practising experience. For the illustration of the results, the dietitians were categorised into 3 cases, based on the workforce size (i.e. Case A for small hospitals, Case B for large hospitals, Case C for solitary dietitians). Findings are documented as testimonial data rather than analytical conclusions derived from numerical data. The findings focused on assessing how the implementation strategy and support around it; peer support and group acclimatisation; availability and structure of HER; and evaluation objectives influence the NCP/NCPT implementation.

Case A introduced the NCP/NCPT after the manager's recommendation. The dietetics team saw the adaptation of NCP/NCPT as something innovative and interesting, that aligned with the diagnostic classification codes that they were already using for their EHR. Their interest to work on something new, made them oversee the difficult and time-consuming nature of NCP. Soon, the department developed their own guide with examples of problem-aetiology-signs and symptoms (PES). In addition, the EHR system was formatted to include PES statements, and dietitians recommended the addition of preformatted sentences or drop-down lists. The evaluation objective for dietitians in Case A was to form a PES statement for every new patient. The goal was 80% of those notes to include a PES statement. Peer support facilitated the acclimatisation of NCP use and encouraged frequent discussions related to NCP.

Implementation of NCP/NCPT in Case B was also recommended by the manager. Dietitians that had been previously formally informed about NCP/NCPT, were designated as team leaders, leading frequent discussion meetings on NCP related topics. The evaluation goal was to write a PES statement for every new patient. Initially the NCP/NCPT was considered by many as complicated and unfit to their practice. Resistance to its implementation remained by some, as they continued to find it complex, time-intensive and ineffectual, regardless of the peer support from the leader team. At some point the discussion groups discontinued due to workforce changes that led to reduced implementation. However, during the same time, the EHR system was updated to include drop-down lists of PES statements, which made the implementation process easier and felt natural to their workflow.

The solitary dietitian represented in Case C, thought of implementing the NCP/NCPT herself, after attending some educational courses. She or her manager did not set an evaluation objective. However, for unspecified reasons she was never able to reach implementation stage. The EHR system used at her facility could not be updated to incorporate NCP related terminology. The lack of peer support, technological infrastructure and easily accessible resources made her resist the idea of implementing NCP/NCPT, as it was much faster for her to keep up with her usual handwriting notes(Lovestam et al., 2017).

For Cases A and B, the evaluation monitoring was discontinued for different reasons, therefore its contribution to NCP/NCPT implementation is not well understood by these findings. Incorporation of PES statements as pre-formulated sentences into the EHR for Cases A and B was a stronger facilitator compared to peer support. However, in Case C where EHR could not accommodate such pre-formulated statements, peer support could have been a strong facilitator.

Another study in Australia, by Porter, Devine and O'Sullivan(Porter, J. M. et al., 2015) recruited a control group/ hospital (n=11) and two test groups/ hospitals (n=24). Three dietitians from each group were assigned as team leaders to coordinate and support the NCP/NCPT implementation. Both groups were asked to complete a validated survey pre (n=35 total; n=24 test groups; n=11 control group) and post (n=23 total; n=14 test groups; n=9 control group) NCP implementation, to collect information on knowledge, attitudes, and facilitating factors relating to NCP/NCPT. In addition, focus groups were conducted for the test sited after NCP implementation (n=11 total, from both test groups). The dietitians from the control hospital were free to choose their implementation strategy. The dietitians from the test group received an 8-stage implementation strategy that was expected to conclude in 5 months (only 7 stages were evaluated in the results). Pre- and post- implementation comparisons between the groups were insignificant for knowledge (P=0.277) and familiarity (P=0.804), while significantly higher for within the test groups (knowledge p<0.01 and familiarity p=0.025). Post implementation confidence between the groups was insignificant (P=0.305), while a significant increase in confidence score, post-implementation, was observed within the test group (p=0.011). Additionally, the test group was significantly more confident in using the NCPT in their practice (p=0.026), they were significantly more likely to make a correct nutrition diagnosis (p=0.034) and develop an appropriate PES statement (p=0.034). Post-implementation perceptions within the control group, related to the applicability or value of the NCP/NCPT in their clinical practice, were significantly worse (p=0.046). The time needed to complete the NCP/NCPT was similar between (P=0.324) and within pre- and post- implementation group comparisons (test group P=0.564; control group P=0.317).

Overall, these findings suggest that exposure to NCP implementation is a stronger predictor of knowledge and confidence than the specific method used to introduce it. They also indicate that while the time allocated for adaptation may support confidence and familiarity, it does not necessarily improve the time it takes to complete the process.

3.6. Case Studies in Asia and the Middle East

A study conducted by Kim and Baek(Kim & Baek, 2013), recruited 35 clinical nutrition managers of Korean general tertiary (n=24) and secondary (n=11) care hospitals. Nine of those managers were from hospitals that were already implementing the NCP, while n=26 from hospitals without prior implementation. Overall, 91.4% (n=32; 100%/n=9 from hospitals implementing, 88.5%/n=23 from hospitals not implementing) were aware of the NCP/IDNT. While overall 96.9% (n=31) received some sort of education/training about NCP/NCPT, their self-reported knowledge on the NCP varied (hospitals implementing / not implementing respectively: n=1/n=0 "very well", n=5/n=3 "well", n=2/n=12 "so-so", n=1/n=8 "poor"). Similar trends observed for the NCPT knowledge (hospitals implementing / not implementing respectively: n=1/n=0 "very well", n=4/n=1 "well", n=3/n=8 "so-so", n=0/n=14 "poor"; n=0/n=1 "very poor"). The lack of knowledge is perceived as a restraining factor for NCP implementation for 66.7% (n=6) of the dietitians from hospitals implementing it and as a factor to avoid implementation for 53.8% (n=14) of the dietitians from hospitals not implementing it.

The NCP was described as time-intensive by 66.7% (n=6) of the participants from hospitals implementing the NCP, mainly because of the changes they had to make to accommodate its implementation. Similar findings were observed from the participants from hospitals not currently implementing it, with 69.2% (n=18) considering its introduction as challenging due to constraints relating to time and human resources. Benefits observed among hospital dietitians implementing the NCP included less difficulty in the decision-making process for forming a nutrition therapy plan (88.9%; n=8), improved quality of nutrition therapy (77.8%; n=7), more consistent performance among colleagues (55.6%, n=5), and improved team communication (44.4%, n=4).

A study by Alkhaldy et al.(Alkhaldy et al., 2020) included 56 dietitians across 6 hospitals in Jeddah, Saudi Arabia. The study had a cross-sectional design and included the questionnaire that was developed by Kim and Baek(Kim & Baek, 2013), with some modifications. All but one dietitian, were aware of NCP. Despite the low percentage that reported to have received training on how to use the NCP (26.8%), 35.3% (n=18) and 25.5% (n=13) of them consider themselves to be excellent or very good users of NCP respectively, and just 2 to be fair users. Five dietitians were not users of the NCP. A small workforce size was the strongest barrier for NCP use (40.9%, n=9). Other barriers were the lack of experience and knowledge (36.4%, n=8) and the interference of NCP implementation with their usual workflow (22.7%, n=5). Participants did not find the NCP to be time-consuming or difficult to complete.

3.7. Institutional and Prototype Evaluation

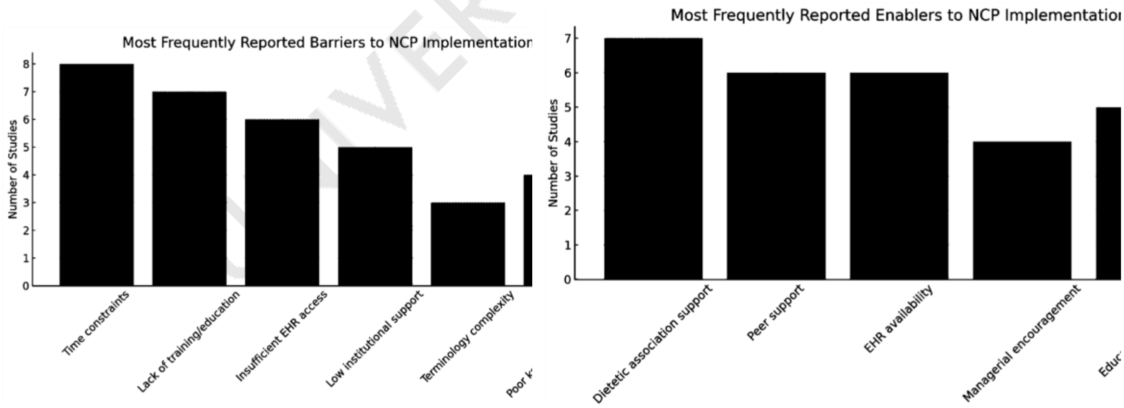
O'Sullivan (2013) created an electronic prototype using the NCP format and its relative steps, with the addition of a section called "client history". The prototype incorporated preformatted diagnoses and intervention dialogs, to choose from as appropriate.

The “monitor and evaluation” step of the NCP was not tested in the pilot study due to budget constraints. The study included different methods of assessment such as questionnaires, pre- and post-statistical analysis (n=12) and an audio recorded focus group (n=7) that incorporated a case study. Some of the benefits of using the NCPT, as identified by the twelve participants, were the standardisation across health record notes (83%) and the systematic approach between the dietitians (75%). On the other hand, 86% of the participants identified the lack of education and training as the strongest barrier for using NCP/IDNT, followed by the time-intensive nature of the tool (14%).

When the prototype electronic health record form was adopted, confidence in using the NCP increased by 17%. Participants consistently preferred the electronic IDNT over the paper version due to its ease of use, retrospective accessibility integration with electronic health records and time efficacy. Initial barriers such as access to a computer, early-stage adjustment and security concerns were considered manageable, especially when GDPR requirements were enforced. The prototype was also considered appropriate as a training tool, with 50% of the participants reporting that it reduces training time through step-by-step menus and facilitates critical thinking. Overall, 65% of the participants are more likely to adopt the electronic IDNT, while 35% felt it did not make any difference and 8% believed it could reduce adoption.

3.8. Regional Patterns of NCP Format

A comparative overview of manual versus software-based NCP use across regions is presented in Figure 3. Uptake of electronic formats was higher in countries like the US and Australia, while manual documentation remains dominant in South Korea and Saudi Arabia. These patterns reflect underlying differences in infrastructure, digital readiness, and health policy enforcement.



(**a**) (**b**)

Figure 2. Factors influencing the nutrition care process (NCP) and nutrition care process terminology (NCPT): (**a**) Most Frequently Reported Barriers to NCP Implementation; (**b**) Most Frequently Reported Enablers to NCP Implementation.

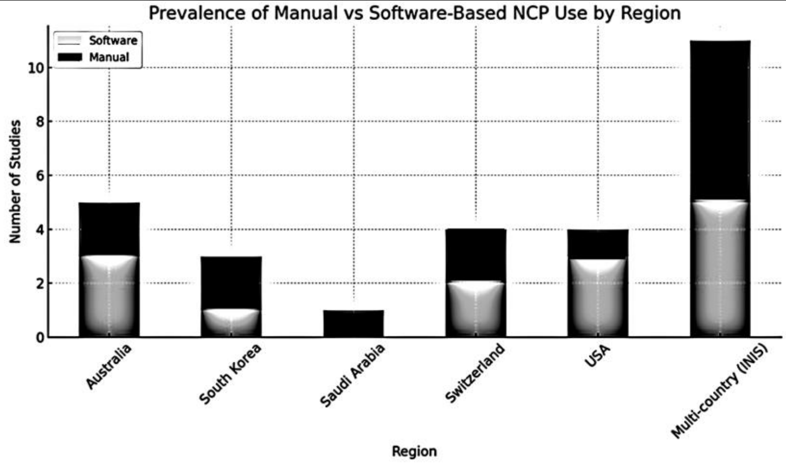


Figure 3. Prevalence of Manual vs Software-Based NCP use by Region.

4. Discussion

Environment limitations such as limited training and technological infrastructure challenges were reported across settings as strong discouraging factors for implementation. Support from NDAs, peer collaboration, and access to EHRs were among the top facilitators across settings. Across studies where EHRs were available and able to accommodate changes to integrate the NCP, in full or in part, implementation rates were higher and were associated with better documentation quality, enhanced practitioner confidence, and improved workflow efficiency. When NCP/NCPT was used for hand-written notes, it was often described as a complex and time-consuming activity. Figure 2(a) presents the 6 most cited barriers and Figure 2(b) the 5 most cited enables across the 11 included studies. The consistency of these factors across geographic contexts highlights the pivotal role of professional networks and institutional readiness in successful implementation. Regional disparities in the NCP format usage were observed. The United States and Australia report higher uptake of software-based formats, while South Korea and Saudi Arabia, continue to rely primarily on manual documentation (Figure 3). These trends suggest that strategies to increase adoption must be context-specific, addressing both technological capacity and localised professional culture.

Given the scarcity of directly comparable studies in the nutrition and dietetics field, evidence from adjacent healthcare professions, particularly nursing, was consulted for triangulation. For example, a documentation audit study by Wang et al.(Wang et al., 2013) in the nursing context found that electronic documentation formats resulted in significantly higher completeness and comprehensiveness than paper-based formats. While causality could not be established, the structured design of electronic templates appeared to enhance both the depth and reliability of recorded data (score: 4/4 vs. 3.52/4, p<0.01). Notably, nurses documented more frequently using the electronic format, which facilitated improved care planning. In contrast, dietitians often work independently, and their documentation, though critical, may not be as operationally mandatory as in nursing shifts, potentially contributing to underutilisation.

Similarly, a randomised clinical trial by Ammenwerth et al.(Ammenwerth et al., 2001) demonstrated that computer-based nursing documentation significantly improved the legibility, completeness, and overall quality of care plans—despite a slight increase in time spent due to the enhanced detail. These findings reinforce the notion that increased time investment in electronic formats can yield higher-quality documentation and more informed patient care decisions.

A more recent investigation by Tomasi et al.(Tomasi et al., 2020) evaluated the electronic and manual formats of the Bedside Paediatric Early Warning System (BedsidePEWS). In simulations, the electronic format led to 15.7% fewer scoring errors and improved decision-making accuracy compared to paper-based tools ($p<0.005$).

Moreover, Snowdon et al.(Snowdon et al., 2015) compared the traditional and electronic Montreal Cognitive Assessment (MoCA vs. eMoCA) in a self-administered setting. While the electronic format required more time to complete (likely due to guided, audio-assisted delivery), it improved test completion and reduced errors due to skipped items—highlighting the role of digital design in enhancing data quality and patient experience.

4.2. Strengths and Limitations of the Included Studies

The methodological quality of the included studies was generally moderate. Out of eight observational studies, only two met the threshold for a "GOOD" quality rating. Most studies lacked key elements of methodological rigor, such as sample size justification, absence of blinding in outcome assessment, or comprehensive statistical adjustment for confounding variables. In several cases, the handling of missing data or potential sources of bias was not clearly described. These limitations may introduce bias, limit the generalisability of findings and should be considered when interpreting the findings of this review.

4.3. Implications for Practice and Policy

The findings of this review highlight the need for tailored strategies to support NCP implementation in various healthcare contexts. Interventions should focus on training and education, especially in regions where formal NCP instruction is lacking.

Integrating NCP/NCPT into existing electronic health record systems (EHRs) appears to be a highly effective enabler. Therefore, healthcare administrators and national dietetic associations (NDAs) should prioritize funding and policy development to facilitate digital integration.

Additionally, promoting peer support models and standardized implementation frameworks may enhance uptake, especially in resource-limited settings or where individual dietitians work in isolation.

4.4. Recommendations for Future Research

Future studies should explore longitudinal impacts of NCP/NCPT use on patient outcomes, beyond implementation metrics such as documentation clarity or practitioner satisfaction.

There is a need for high-quality interventional studies—such as randomized controlled trials (RCTs) or controlled before-after studies—to assess the effectiveness of NCP training programmes, EHR integration, and policy interventions.

More research is also needed in underrepresented regions, such as Eastern Europe, the Middle East, and parts of Asia and Africa, to assess barriers and enablers in culturally and structurally different health systems.

5. Conclusions

This review highlights the potential benefits of integrating standardized clinical tools—such as the Nutrition Care Process (NCP) and Nutrition Care Process Terminology (NCPT)—into routine dietetic practice. Implementation of these tools promotes consistency, improves documentation quality, and may contribute to safer, more effective patient care.

Across diverse healthcare settings, digital integration of the NCP into electronic health records (EHRs) emerged as a key enabler, particularly when paired with institutional support and peer mentorship. In contrast, manual or paper-based formats were consistently associated with lower adoption rates and perceptions of higher complexity.

To improve uptake, efforts should prioritize the development of nationally endorsed standards, structured training, and scalable digital formats of the NCP. Investment in electronic documentation infrastructure, along with peer-led implementation models, may accelerate widespread adoption.

In conclusion, this review provides a global perspective on the challenges and enablers of NCP implementation. Addressing the identified barriers through targeted policy, training, and technology initiatives could enhance the consistency, quality, and impact of dietetic care worldwide.

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Abbreviations

The following abbreviations are used in this manuscript:

CCP(s)	Clinical Care Process(es)
EHR	Electronic health record
EMBASE	Excerpta medica database
IDNT	International dietetics and nutrition terminology
MEDLINE	Medical literature analysis and retrieval system online
NCP	Nutrition Care Process
NCPT	Nutrition Care Process Terminology
NDA	National dietetic association
NIH	National heart, lung, and blood institute
PES	Problem, aetiology, signs and symptoms
PICOS	Participants, interventions, comparison, outcomes, study design
PRISMA	Preferred reporting items for systematic reviews and meta-anal

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2.1.3 Global Patterns of NCP Implementation

The review revealed substantial variability in NCP/NCPT implementation across countries and practice settings.

Implementation was strongest in countries where the following conditions were present:

- National Dietetic Associations (NDAs) formally endorsed the NCP
- Structured training programmes were available
- Electronic Health Records (EHRs) integrated NCP steps or terminology

The United States (US) and Australia demonstrated higher uptake of electronic formats, reflecting earlier adoption timelines and stronger digital infrastructure. In contrast, South Korea and Saudi Arabia relied more heavily on manual or partially structured documentation formats.

Multinational analyses indicated that inpatient settings were significantly more likely to implement structured NCP documentation compared to community or public health settings. Years since graduation was negatively associated with implementation rates, suggesting generational differences in adoption (Alkhaldy et al., 2020; Kim & Baek, 2013).

2.1.4 Format as a Determinant of Implementation

One of the most consistent findings across studies was the influence of documentation format on perceived feasibility and sustainability.

Where NCP/NCPT was integrated into electronic systems:

- Implementation rates were higher
- Documentation clarity improved
- Practitioner confidence increased
- Workflow efficiency was enhanced

Electronic prototypes incorporating structured diagnostic prompts and preformatted PES statements were associated with improved usability and reduced ambiguity.

Conversely, handwritten or unstructured manual formats were frequently described as:

- Time-consuming
- Complex
- Difficult to standardise
- Difficult to audit

This pattern suggests that format may function not merely as a contextual variable, but as a structural determinant shaping implementation fidelity and user experience (Lovestam et al., 2017).

2.1.5 Barriers and Enablers Across Contexts

Time constraints, insufficient training, limited technological infrastructure, and weak managerial support were the most frequently cited barriers to implementation. Conversely, endorsement from national dietetic associations, peer mentorship, structured training programmes and access to customisable EHR systems were consistent enablers across studies. The recurring nature of these factors underscores the importance of organisational readiness and professional networks in sustaining adoption.

2.1.6 Quality of Evidence and Gaps

Despite the growing body of literature on NCP/NCPT implementation, the overall quality of evidence remains moderate. Most included studies relied on cross-sectional or descriptive designs and focused primarily on self-reported awareness, attitudes, and perceived barriers rather than objective measures of implementation fidelity or documentation quality. Only a limited number of studies examined electronically supported documentation tools directly, and even fewer evaluated fully functional digital systems in practice.

These limitations restrict the strength of causal inferences that can be drawn regarding the relationship between documentation format and implementation outcomes. In particular, the literature remains stronger in describing patterns of adoption than in explaining how or why specific documentation environments support sustained implementation. These evidence gaps provide an important rationale for further applied research examining structured digital documentation within real-world professional contexts.

2.1.7 Implications for the Present Study

The systematic review demonstrates that digital integration of structured documentation frameworks is consistently associated with improved implementation indicators across international settings. However, three major gaps remain:

1. Documentation format has not been consistently conceptualised as an independent determinant of implementation fidelity.
2. There is limited validation of context-specific digital PNDP/NCP tools.
3. Small or digitally evolving health systems remain underrepresented in the evidence base.

These gaps provide direct justification for the present doctoral study, which examines implementation in relation to manual and software-based documentation contexts within the Cypriot healthcare system and incorporates empirical validation of a context-adapted electronic tool.

2.1.8 Current Evidence on NCP and NCPT, with particular focus on implementation format and related uptake

The strongest direct example of an electronic NCP tool within the included studies is the prototype developed by O'Sullivan (2013). Developed with software support and based on the structure of the NCP, the prototype included all major NCP steps together with an additional “client history” section. It incorporated ready-to-select diagnoses and intervention options, allowing prioritisation according to the most urgent nutrition issue. However, the prototype was not fully functional because of budget restrictions: follow-up visit notes were not feasible, the monitoring and evaluation step was therefore not tested, and some patient groups (including renal patients and those with other unspecified characteristics) could not be managed through the system. Evaluation included questionnaires, pre–post testing (n = 12), and an audio-recorded focus group (n = 7) using a case study approach.

Participants identified standardisation of reporting and support for a systematic approach as key benefits of using the NCP. At the same time, lack of education and training emerged as the strongest reported barrier, followed by time burden. After exposure to the prototype, confidence in using the NCP increased, and participants generally preferred the electronic format to paper because of ease of use, retrospective accessibility, integration with electronic health records, and perceived time efficiency. The prototype was also considered useful as a training support, particularly through its step-by-step structure and guided menus, which were reported to facilitate critical thinking and reduce training burden (O'Sullivan, 2013).

In addition to prototype development, several implementation studies indirectly assessed “electronic documentation” conditions in routine practice systems and infrastructure. Lovestam, Steiber et al. (2019), recorded the use of NCP and NCPT across 10 countries that had started using the NCP/NCPT anytime between 2009 and 2014 and tried to compare the level of implementation between those 10 countries, using an online survey completed by dietitians across the 10 countries in 2017. The 10 countries participating were Australia, Canada, Greece, Switzerland, Ireland, Denmark, New Zealand, the United States, Sweden and Norway. Sample characteristics differed between the countries because of the multinational concept of the study. Differences included variation in sample size by country, the preferred implementation strategy for the countries that already introduced the NCP/NCPT and the participation of a country that had not introduced it yet, namely Greece. The questionnaire used was the International NCP/NCPT Implementation Survey (INIS), a validated tool estimated to take 20 minutes to complete and consisting of four modules, of which only the results of demographic characteristics (Module 1, n=6459) and NCP/NCPT implementation (Module 2, n=5255) are presented. The study was also referred to as the INIS study. Because the main interest of the research was to assess the level of implementation of the NCP and each step of NCP separately, participants who answered as unaware of the NCP were directed to the end of the study and were recorded as never using the NCP/NCPT and never planning to use it. Each step of NCP and NCPT was explained to participants within the relevant sections of the question. Most of the completed questionnaires were from the US, who also contributed the largest sample size, a possible disadvantage for the study, as the results could have been disproportionately influenced by this majority contribution.

Only half of the participants (50%) from Greece were aware of the NCP/NCPT, whereas over 90% of respondents from the remaining countries reported awareness of these tools. Among those aware, the NCP was more frequently or longer implemented than the NCPT ($P < 0.001$ for both frequency and duration parameters). Dietitians that participated in focus groups in Australia, found certain terms within the NCPT to be potentially offensive or inappropriate when referring to patients, therefore providing an explanation to its limited use by the participants. However, this concern was addressed in the 2016 NCPT update, which introduced more sensitive synonyms. Despite these improvements, updated statistics are needed to assess whether the revisions have led to increased implementation and acceptance of both NCP and NCPT across diverse clinical settings. Dietitians working in inpatient setting were significantly more likely to implement the NCP and NCPT (81% and 61%, respectively), than dietitians working in public health settings (54% and 28%, respectively) ($P < 0.0001$).

The Module 3 (factors influencing NCP implementation, n=5727) was published as part of a secondary analysis investigating the attitudes, barriers and enablers related to NCP across the 10 countries. They also assessed for similarities in trends between the 10 countries.

The recommendation from a national dietetic association (NDA) to use the NCP was the strongest enabler (69%), followed by the support of their peers (63%) and the availability of electronic health records (EHR) (55%). However, the magnitude of an NDA recommendation demonstrated significant variation across the nations. Specifically, 73% of participants in the USA cited it as a determinant of implementation, whereas only 44% of the Norwegians did so. This suggests that the level of a NDA preparedness and infrastructural capacity to support such directives are important for effective adaptation by the dietitians. Dietitians in Greece were not asked about the current recommendations by the NDA or about the Lack of training and education relating to the NCP, since its implementation has not yet been established at that time. Overall, the time to implement the NCP was the strongest barrier (39%), followed by inadequate training and knowledge (32%). Variability was observed in the perception of the time-intensive nature of the NCP, as well as for the training aspect with 85% and 77%, respectively among Norwegians participants and only 49% and 16% votes from the Australian and New Zealand participants respectively.

In 2021, data collected from Module 3 from the original study by Lovestam, Steiber et al. (2019), were re-analysed by Vinci et al. (2023), this time focusing on the attitudes, barriers and enablers related to NCP implementation in routine practice, in German- and French- speaking dietitians in Switzerland. The sample size after isolating the German-French speakers was reduced to 228 dietitians, representing the 19% of the dietitians in the country in 2012 (n=144 German, n=84 French speaking). Inclusion criteria were to have completed their dietetics training and answered all parts of the survey. Seventy percent of the participants worked with outpatients and 63% with inpatients. In addition, 28% (n=63) were self-employed, with the majority of those (39%) being French speakers ($P<0.01$). Of the rest of the sample, 12% were involved in teaching, 11% in community work and 10% in management. Engagement with community and academic work was more prevalent in the French speaking group compared with the German-speaking group ($P<0.01$).

Awareness of the NCP/NCPT was almost universal (99%) with frequent use of the two tools by the majority (72%). Peer support and NDA influence were the strongest enablers for NCP/NCPT implementation for both groups. Barriers were similar across the groups, such as protected time, insufficient knowledge or training, EHR and financial constraints and more. Like previous results, NDA influence was heterogeneous between Germans and French speakers (89% vs 77%; $p<0.05$). Other factors showing significant variation between the groups included access to EHR (81% German vs 44% French speakers; $p<0.001$) and workplace NCP use enforcement (75% German vs 53% French speakers; $p<0.05$).

Consistency was observed between the two groups regarding perceived barriers to the implementation of the NCP and NCPT. Barriers were reported in hierarchical order from most to least prevalent and included lack of time, insufficient knowledge, inadequate training and education, limited availability of electronic health records (EHRs), financial constraints, lack of managerial support, low motivation or limited perceived need to change existing practices, restricted access to online tools and professional resources, and insufficient peer support.

Implementation rates differed significantly across the four NCP steps ($p < 0.001$). Nutrition Assessment was most frequently utilised (71% reporting frequent or consistent use), followed sequentially by Nutrition Diagnosis, Nutrition Intervention, and Nutrition Monitoring and Evaluation, reflecting the original structured flow of the NCP. Significant differences were also observed in NCPT utilization across steps ($p < 0.001$), with Nutrition Diagnosis most frequently implemented (60% reporting frequent or consistent use), followed by Nutrition Assessment, Nutrition Intervention, and Nutrition Monitoring and Evaluation. Furthermore, NCPT implementation was associated with shorter implementation times compared with the broader NCP framework ($p < 0.0001$).

More than half of participants reported having implemented all four NCP steps for at least one year, with Nutrition Diagnosis typically being the first step adopted ($p < 0.0001$). Nevertheless, 19% of respondents indicated no intention to use the Nutrition Diagnosis step, and approximately 25% reported no intention to adopt any of the remaining three NCPT steps.

Geographic location emerged as a significant determinant of both NCP and NCPT implementation. Using the United States as the reference country, all countries except Australia demonstrated significantly lower implementation rates, including New Zealand ($p < 0.001$) and Canada, Switzerland, Denmark, Sweden, Norway, Ireland, and Greece (all $p < 0.0001$). These differences were partially attributed to variations in the timing and methods of NCP/NCPT introduction. The United States introduced these tools in 2003, followed by Australia in 2009, whereas implementation in Greece remained ongoing at the time of the study (O'Sullivan et al., 2019).

Educational attainment (Bachelor's, Master's, or Doctoral degree) was not significantly associated with implementation. However, years of professional practice demonstrated a negative association, with implementation rates decreasing for each additional year since qualification ($p = 0.0001$). Higher implementation scores were reported among dietitians working in inpatient and outpatient clinical settings, academic or teaching roles, and managerial positions ($p < 0.0001$). In contrast, practitioners working in community settings, research roles, or those not currently practising as dietitians showed no significant association with implementation. Lower implementation was observed among those in consultation or business practice ($p = 0.007$), foodservice ($p = 0.004$), and other roles ($p = 0.001$), while the lowest rates were reported in public health settings ($p < 0.0001$). This pattern likely reflects the clinical orientation of the NCP/NCPT, which is primarily designed to support individualised, patient-centred care rather than population-level interventions.

Several limitations were noted. The disproportionate response rates across countries may have influenced the findings, potentially limiting generalisability. Additionally, participation bias may have occurred, as respondents were likely to be individuals already familiar with or using the NCP/NCPT, which may have inflated estimates of awareness and implementation. Consequently, the authors recommend that future research employ smaller, strategically selected samples to produce more representative and less biased estimates of NCP/NCPT utilisation.

O'Sullivan et al. (2019), evaluated knowledge, familiarity and concerns related to NCPT as influencing factors for its implementation in the Asia-Pacific region. Additionally, they tried to explore how important or applicable NCPT is perceived to be in routine clinical practice. The study used the validated ASK NCP survey. A total of 377 dietitians across the Asia-Pacific region were included, contributing to varying percentages of registered dietitians per locale.

Specifically, 209 participants from Australia representing 5% of their registered members, 41 participants from New Zealand representing 7% of their registered members, 51 participants from Singapore representing 55% of their registered members, and a total of just four participants from Philippines, Indian and USA combined. Only 6% participants reported their country of residence.

Across the countries, 81.7% of the participants considered the NCP applicable to their practice, but only 65.1% currently use it. The NCP and IDNT were perceived as a useful tool for improving patient care by 55% of the participants, but as inconvenient to implement by 19.6%. Lack of training and support, as well as insufficient time, were the strongest predictors for resisting implementation of NCP with 25.5% votes, followed by lack of knowledge (23.8%). Those findings coincide with previous studies and highlight the need for a better support system by the organisational bodies as well as the need for a discussion on a time management solution.

Vivanti et al. (2018) explored the trends in NCPT use and knowledge over a three-year study focusing on factors enabling or disenabling its implementation, as a way of supporting its effective use in the future. The study took place in Australia at two phases, using the validated Attitudes, Support, Knowledge, of the nutrition care process (ASK NCP) survey. Participants were members of the Dietitians Association of Australia. A total of 218 members completed the survey in 2011 and 205 completed it in 2014. The time-consuming nature of NCP/NCPT remained the strongest disabling factor in both years ($p = 0.84$, 40% in 2011 and 41% in 2014), despite considerably higher levels of NCP/IDNT knowledge (mean $P < 0.0175$), as well as improved familiarity with and confidence in using the NCP in 2014 compared with 2011 ($P < 0.001$). Thus, the time barrier persisted.

Paradoxically, although participants in 2014 acknowledge the multiple benefits supporting the NCP use including improved interdisciplinary communication, enhanced critical reasoning and better patient care ($P < 0.001$), a higher proportion, compared to 2011, still do not see clear benefits in its use. However, despite the accepted benefits and implications of NCP, there seems to be a potential disconnect between theoretical advantages and practical experience, since its time-expensive process leads to implementation resistance ($P=0.002$).

Within institutional settings in Korea and Saudi Arabia, barriers included insufficient knowledge, limited staffing, and workflow-related constraints. A study conducted by Kim & Baek (2013), recruited the clinical nutrition managers of 35 Korean general tertiary (n=24) and secondary (n=11) care hospitals and explored their perceptions, status of implementation and stance on NCP. Among the participants 91.4% were aware of the NCP/IDNT. Sources of awareness mainly included academic society programmes and educational courses provided by the Korean dietetic association (78.1% and 53.3% respectively for NCP; 77.4% and 54.8% respectively for IDNT). Literature and colleague interaction were less common sources for NCP/IDNT acquaintance (40.6% and 31.1% respectively for NCP; 25.8% and 22.6% for IDNT). While 96.9% (n=31) of those received some sort of education/training about NCP/NCPT, 43.8% described their knowledge as "so-so" (NCP) or poor (NCPT), even though 9 of those hospitals have already implemented the NCP at the time. In addition, 66.7% of all participants consider the insufficient knowledge to interfere with NCP implementation in facilities that had already adopted it and 53.8% to prevent them from adopting it.

Three of those nine hospitals that were already using the NCP, implemented all steps of the process and six of them only parts of it. Seven of those hospitals were also using the IDNT for their NCP records, with IDNT being used by all seven hospitals to form a nutrition diagnosis (100%) and four hospitals (57.1%) were using it for the nutrition assessment step. Just two hospitals used it to plan a nutrition intervention (28.6%) and only three for the Nutrition monitoring and evaluation steps (42.9%). The NCP was described as time-intensive by 66.7% of the participants, mainly because of the changes they had to make to accommodate its implementation, and challenging to introduce by 69.2% due to constraints relating to time and human resources. However, 88.9% of the participants found it easier to plan a nutrition therapy when using the NCP, 77.8% noticed an improvement in their quality of care, 55.6% thought it made nutrition care more consistent between colleagues and 44.4% that improved team communication.

A study by Alkhaldy et al. (2020) included 56 dietitians across 6 hospitals in Jeddah, Saudi Arabia hospitals. The study had a quantitative, cross-sectional design with a questionnaire adopted by Kim & Baek (2013) with some modifications and was then validated via a pilot. The study aimed to obtain a better understanding of dietitians' perceptions relating to NCP implementation. All but one dietitian were aware of NCP, mainly from their studies (64.3%) or through colleague interactions (23.2%) but most have never received training about it (73.2%, n=42). Despite the low percentage of participants who reported having received training on NCP use (26.8%), 35.3% (n=18) rated themselves as excellent users and 25.5% (n=13) as very good users, while only two participants rated themselves as fair users. Five dietitians did not use the NCP.

In addition, NCP is the most used nutritional assessment tool with a percentage of 62.5% (n=35), compared to the ICF-D and IDNT which are equally used by 12.5% of the hospitals (n=7 for each tool). Eighty-five point four percent of the hospitals used the NCP in all wards (n=35) whereas 14.6% (n=6) use it only in some wards. In addition, 92.9% (n=52) of participating dietitians believed that their hospital should follow the NCP protocol, while 37.5%

(n=21) reported no perceived challenges to its implementation. Other opinions, such as difficulty in completing all five steps of NCP (ADIME – Assessment, Diagnosis, Intervention, Monitoring and Evaluation) was described by 23.2% (n=12), as well as in a particular section of the process including the assessment (5.4%, n=3), the nutritional diagnosis (7.2%, n=4), the monitoring and evaluation (8.9%, n=5), or choosing a reference (8.9%, n=5). A percentage of 8.9% (n=5) is not using the NCP. Small workforce size was the strongest barrier for NCP use (40.9%, n=9). Other barriers were the lack of experience and knowledge (36.4%, n=8) and the interference of NCP implementation with their usual workflow (22.7%, n=5). Participants did not find the NCP to be time-consuming or difficult to complete.

Finally, Porter et al. (2015) developed an NCP implementation package in Australia, whose efficacy was evaluated on a previous pilot study. The purpose of the current study was to report these findings and to evaluate trends in NCP implementation arising from this package, with the aim of informing recommendations for countries or facilities planning to adopt the tool. The study included a control hospital (n=11) and two test hospitals (n=24). Each hospital had a leading team of 3 dietitians acting as coordinators with an educative and supportive role. The dietitians in the control hospital were not given any information about NCP/ NCPT implementation, but they were allowed to do their own research. The test hospitals received a briefing on the implementation process, consisting of 8 stages and lasted for 5 months. However, for the purposes of the study, only the 7 stages were evaluated. Both teams were asked to complete the ASK NCP survey before (n=35) and after (n=23, n=14 from the test and n=9 from the control hospital) the implementation of the NCP to collect information on knowledge, attitudes, and facilitating factors relating to NCP/NCPT implementation. Pre- and post-implementation comparisons between the groups were not statistically significant for knowledge ($p = 0.277$), familiarity ($p = 0.804$), or confidence ($p = 0.305$). There were, however, significant changes in knowledge ($p < 0.01$) and confidence ($p = 0.011$) in NCP use from within pre and post implementation test hospital comparisons. Participants from the test hospital, were also more likely to choose a suitable nutrition diagnosis or to write a PES statement ($p = 0.034$). The time needed to complete the NCP/NCPT was similar between ($p = 0.324$) and within pre and post implementation hospital comparisons (test hospital $p = 0.564$; control hospital $p = 0.317$).

Taken together, the included studies suggest that digital tools and e-health infrastructure can support NCP adoption through improved documentation structure and workflow alignment, but successful implementation remains highly sensitive to training capacity, time demands, organisational readiness, and the practical ability of EHR systems to accommodate NCP/NCPT formats, rather than the specific method used to introduce it.

2.2 Theoretical Foundations of Dietetic Practice

2.2.1 Evidence-Based Practice (EBP) in Clinical Nutrition through PNDP/NCP

Evidence-based practice (EBP) constitutes a foundational principle of contemporary healthcare, requiring the integration of the best available research evidence with clinical expertise and patient values. Within clinical nutrition, this integration is operationalised through structured decision-making systems that translate abstract evidence into consistent, patient-centred care. The NCP and the PNDP provide a standardised, evidence-informed framework that guides practitioners through nutrition assessment, diagnosis, intervention planning, and outcome monitoring in a systematic and reproducible manner.

In this sense, the NCP functions not merely as a procedural checklist but as a practical embodiment of evidence-based reasoning. It requires dietitians to explicitly connect assessment findings with diagnostic conclusions and to justify intervention strategies through clinical logic grounded in evidence (Papoutsakis et al., 2017). By structuring care into defined, sequential phases, the NCP ensures that decisions are traceable, transparent, and auditable. Rather than relying on implicit judgement or narrative-style documentation, the framework obliges practitioners to articulate why a particular nutrition diagnosis is prioritised, how it is linked to identifiable aetiologies, and which measurable outcomes will indicate improvement.

This structured approach enhances professional accountability and supports quality assurance. The consistent logic underpinning PNDP/NCP allows for comparability across practitioners, institutions, and even national systems. Such comparability is essential not only for evaluating patient outcomes but also for assessing fidelity of implementation and adherence to professional standards. In environments undergoing digital transformation, the auditable nature of NCP documentation becomes particularly relevant, as structured entries can be aggregated, analysed, and benchmarked within electronic health systems.

2.2.2 The Role of Clinical Reasoning in Dietetics

Clinical reasoning is central to dietetic practice because nutrition-related problems rarely involve isolated variables. They are shaped by complex interactions between medical diagnoses, biochemical indicators, dietary behaviours, socioeconomic factors, cultural influences, and patient preferences. As a result, effective nutrition care requires interpretative judgement rather than mechanical protocol adherence.

Both the NCP and PNDP are designed to scaffold this reasoning process. They guide practitioners from data collection (assessment) to interpretation (diagnosis), and subsequently to action (intervention and monitoring), while maintaining a coherent logical pathway between each step. This internal coherence is essential for ensuring that interventions are not merely evidence-informed in theory but are contextually appropriate in practice.

Clinical reasoning becomes particularly visible at decision points where professional judgement is required. These include determining which assessment data are clinically significant, distinguishing primary from secondary nutrition diagnoses, prioritising competing nutrition problems, and selecting outcome indicators that are realistic, measurable, and meaningful. The NCP strengthens this reasoning process by requiring explicit links between identified problems and proposed interventions, reducing ambiguity and enhancing clarity in documentation.

Moreover, structured reasoning supports continuity of care. When documentation reflects clear diagnostic logic and measurable goals, subsequent practitioners can understand not only what was done, but why it was done. This is especially important in multidisciplinary and digitally mediated environments, where patient records function as the primary vehicle for interprofessional communication.

2.2.3 Decision-Making Frameworks and the PNDP Structure

Decision-making in dietetics can be conceptualised as a cyclical and iterative process that mirrors the logic of the PNDP/NCP framework. It begins with the systematic identification and interpretation of relevant clinical, nutritional, and contextual data through comprehensive assessment. Based on this evaluation, the practitioner formulates a structured nutrition diagnosis that clearly defines the problem and its underlying aetiology. Targeted interventions are then planned and implemented in alignment with the identified causes and patient-specific goals. Finally, outcomes are monitored and evaluated, with reassessment undertaken as necessary. This evaluative phase may prompt revision of earlier decisions, reinforcing the dynamic and responsive nature of dietetic clinical reasoning.

This framework promotes critical thinking by obliging the practitioner to articulate the rationale underpinning each step and to modify care when anticipated outcomes are not achieved. Rather than viewing care as linear, the PNDP/NCP framework recognises the dynamic nature of patient progress and encourages reassessment as an integral component of practice.

Within this structured logic, the use of standardised language (SL) further enhances decision quality. For example, nutrition diagnosis statements structured according to the Problem–Aetiology–Signs/Symptoms (PAS) format reduce variability in how clinical problems are defined and communicated. By formalising the relationship between cause and manifestation, PAS statements make reasoning explicit and improve clarity in documentation. This supports both intra-professional consistency and interdisciplinary understanding.

Standardised terminology also facilitates interoperability within electronic health records. When documentation is embedded in digital systems using structured fields and consistent vocabulary, it becomes more readily searchable, auditable, and analysable. However, the digital translation of structured frameworks introduces additional considerations, including usability, training requirements, workflow integration, and time efficiency. The benefits of structured electronic documentation depend not only on conceptual robustness but also on system design and practitioner acceptance.

Understanding PNDP/NCP as a decision-making framework therefore provides the theoretical foundation for examining documentation practices, digital tool integration, and professional adoption patterns in later sections of this thesis. As noted by O'Sullivan (2013) the effective implementation of the NCP within electronic systems depends on aligning clinical reasoning structures with technological functionality. Consequently, analysing PNDP/NCP through both epistemological (how knowledge informs practice) and technological (how systems support reasoning) lenses is essential when investigating manual versus software-based documentation formats.

2.3 Standardisation in Dietetic Practice

2.3.1 Origin and Adoption of the NCP and PNDP

The NCP and its associated terminology, the Nutrition Care Process Terminology (NCPT), were formally introduced by the American Dietetic Association—now the Academy of Nutrition and Dietetics—in the early 2000s as a structured model designed to standardise nutrition care delivery and improve outcome monitoring across practice settings (Swan et al., 2017). The development of the NCP represented a strategic effort to strengthen evidence-based dietetic practice by embedding a systematic, stepwise approach to assessment, diagnosis, intervention, and monitoring within a unified professional framework. Central to this initiative was the creation of a standardised language (NCPT) to ensure consistency in documentation, facilitate data aggregation, and enhance comparability of practice across institutions and regions.

Building on the conceptual structure of the NCP, the BDA introduced the PNDP in 2006 as a profession-specific framework tailored to the UK context. While closely aligned with the NCP in its stepwise logic and emphasis on structured clinical reasoning, PNDP was adapted to reflect UK regulatory standards, professional expectations, and healthcare system structures (BDA, 2021). The PNDP thus functions as a contextualised implementation of the broader NCP model, preserving its core principles while embedding them within national governance and practice environments.

Over time, the NCP gained international recognition beyond the United States. In 2016, the International Confederation of Dietetic Associations (ICDA) incorporated the NCP framework into global competency standards for qualified nutritionists and dietitians, reinforcing its status as an internationally endorsed model of structured nutrition care (International Confederation of Dietetic Associations, 2016). This inclusion marked an important milestone in the global diffusion of the NCP, signalling its relevance across diverse healthcare systems and cultural contexts.

Similarly, in the United Kingdom, elements of the PNDP framework have been reflected within professional proficiency standards overseen by the Health and Care Professions Council (HCPC) since the late 2000s. The integration of structured care principles into regulatory competency requirements underscores the institutionalisation of PNDP within professional governance structures. Furthermore, the Academy of Nutrition and Dietetics' Revised 2012 Standards of Practice and Standards of Professional Performance explicitly align professional expectations with NCP implementation, reinforcing its normative status within clinical dietetics (The Academy Quality Management Committee and Scope of Practice Subcommittee of the Quality, Management Committee, 2013).

Collectively, these developments illustrate a progressive institutionalisation of structured nutrition care models at national and international levels. The diffusion of NCP and PNDP frameworks through professional associations, regulatory bodies, and competency standards reflects a broader movement toward standardisation, accountability, and outcome-oriented practice in dietetics. However, while policy-level endorsement and professional recognition are well established, evidence regarding consistent operational implementation, particularly in digitally integrated formats, remains uneven across settings. This divergence between formal adoption and practical integration provides a critical context for examining contemporary implementation dynamics.

2.3.2 Benefits of standardised language: PES statements, diagnosis, interventions

The NCP and its associated standardised terminology (NCPT/IDNT) have been promoted internationally as structured mechanisms for enhancing consistency, transparency, and quality in dietetic documentation and clinical reasoning. By organising clinical encounters into clearly defined stages—assessment, diagnosis, intervention, and monitoring and evaluation—the NCP provides a systematic pathway through which evidence is translated into practice. Within this structure, the use of standardised language serves not merely as a documentation tool but as a cognitive framework that shapes how nutrition problems are identified, articulated, and addressed.

Across the reviewed studies, the NCP was most frequently discussed as a mechanism for standardising documentation through implementation of its four steps and associated terminology (Lovestam et al., 2017; Vinci et al., 2023). In particular, the formulation of nutrition diagnoses using structured statements, commonly in the Problem–Aetiology–Signs/Symptoms (PAS or PES) format, was highlighted as a critical component of professional reasoning. The PES structure requires the practitioner to explicitly link a nutrition-related problem to its underlying cause and to supporting clinical evidence. This structured articulation reduces ambiguity, enhances clarity, and strengthens the logical coherence of care planning.

The diagnostic step is especially significant because it distinguishes dietetic reasoning from medical diagnosis. A medical diagnosis identifies a disease or pathological condition, whereas a nutrition diagnosis identifies a nutrition problem that the dietitian is responsible for addressing. For example:

- Medical diagnosis: Type 2 Diabetes Mellitus.
- Nutrition diagnosis (PES statement): Excessive carbohydrate intake related to frequent consumption of refined sugars and sweetened beverages as evidenced by dietary recall showing intake exceeding recommended carbohydrate levels and elevated HbA1c (8.2%).

In this example, the medical diagnosis describes the disease state, while the nutrition diagnosis identifies a modifiable nutrition problem within the dietitian's scope of practice. The PES statement makes the causal reasoning explicit: the problem (excessive carbohydrate intake), the aetiology (refined sugars and sweetened beverages), and the supporting evidence (dietary recall and laboratory data).

This distinction reinforces professional accountability and clarifies the unique contribution of dietitians within multidisciplinary teams. When nutrition diagnoses are documented in a structured format, they become visible and measurable, supporting both continuity of care and outcome evaluation. Structured diagnostic statements also facilitate interdisciplinary communication by presenting concise, logically organised information that can be readily interpreted by other healthcare professionals.

Beyond diagnosis, standardised terminology supports consistency in describing interventions and monitoring indicators. By using agreed vocabulary to document nutrition education, dietary modifications, supplementation strategies, or behavioural counselling approaches, variability in language is reduced. This standardisation enhances comparability across practitioners and settings, enabling aggregation of data for audit and quality improvement purposes (Lovestam et al., 2017; Vinci et al., 2023).

Importantly, the use of PES statements and structured language strengthens evidence-based practice (EBP). The requirement to provide observable signs and measurable symptoms as justification for a diagnosis compels practitioners to ground decisions in objective data rather than assumption. Similarly, linking interventions directly to identified aetiologies ensures that care plans are logically derived from assessment findings. In this way, standardised language functions as a safeguard against fragmented or unsystematic decision-making.

However, while the conceptual benefits of PES statements and standardised terminology are widely acknowledged, their practical application depends on adequate training, familiarity, and supportive documentation systems. Without structured templates or digital prompts, formulation of PES statements may be perceived as time-consuming or cognitively demanding, particularly in high-volume clinical environments. Thus, the effectiveness of standardised language is closely intertwined with workflow integration and technological support.

Overall, standardised terminology within the NCP/PNDP framework enhances clarity, diagnostic precision, professional accountability, and interdisciplinary visibility. It transforms documentation from narrative description into structured clinical reasoning, thereby reinforcing the scientific and evidence-informed foundation of dietetic practice. When embedded within electronic health record (EHR) systems, PES statements offer additional advantages beyond conceptual clarity. Digital templates that incorporate structured diagnostic fields can prompt completion of the Problem, Aetiology, and Signs/Symptoms components, thereby reducing omission errors and improving documentation completeness. Electronic systems also enable standardised terminology to be coded, searchable, and retrievable for audit, quality improvement, and research purposes (Swan et al., 2017). Studies examining electronic NCP integration report that structured digital menus and preformatted diagnostic options enhance usability, reduce variability in phrasing, and increase practitioner confidence in formulating nutrition diagnoses (Lovestam et al., 2017; O'Sullivan, 2013). Furthermore, when PES statements are electronically documented using consistent terminology, they facilitate interdisciplinary communication by allowing other healthcare professionals to access clearly defined nutrition problems within shared records, strengthening the visibility and accountability of dietetic interventions (Vinci et al., 2023). In this way, digital documentation does not merely store PES statements; it operationalises them as structured, analysable data elements within broader healthcare systems.

2.3.3 Introduction to the NCP and PNDP

The NCP was generally implemented more frequently and for longer periods than the NCPT, suggesting that clinicians may adopt the broader process framework more readily than the full terminology set (Lovestam, Steiber et al., 2019). Nevertheless, NCPT use was linked to more efficient implementation compared with the broader NCP framework in some contexts, and utilisation patterns varied by step, with Nutrition Diagnosis often emerging as the most actively implemented NCPT component (Vinci et al., 2023). Importantly, stronger implementation was consistently reported in settings where electronic health records could accommodate structured NCP documentation, including templates and drop-down options for PAS statements, indicating that digital infrastructure supports both feasibility and routine uptake (Lovestam et al., 2017).

2.3.4 Challenges in implementation

Adoption and implementation were strongly shaped by professional and organisational motivators. In the INIS study, a recommendation from an NDA was the most frequently reported enabler of NCP implementation, followed by peer support and EHR availability. However, the influence of NDA recommendations varied substantially between countries and subgroups, implying that professional bodies' readiness and local implementation capacity may determine how effectively standardisation initiatives translate into routine practice (Lovestam, Steiber et al., 2019; Vinci et al., 2023). In workplace-level qualitative evidence, implementation was often triggered by managerial endorsement and reinforced when local leaders facilitated discussion and skill-building, while implementation weakened when support structures were disrupted (e.g., workforce changes). These findings align with the broader observation that implementation is not solely an individual decision but reflects institutional readiness, leadership, and the practical availability of tools that integrate standardised language into everyday workflow (Kim & Baek, 2013; Lovestam et al., 2017).

Despite the widely recognised benefits, including improved documentation consistency, enhanced interdisciplinary communication, and increased practitioner confidence, implementation challenges persist across regions.

Time constraints were repeatedly identified as a primary barrier to adoption, even in contexts where knowledge and confidence increased over time following education or exposure to implementation initiatives. Similarly, inadequate training and limited knowledge were commonly reported barriers, with some studies showing that formal exposure to the NCP improved competence related to nutrition diagnosis identification and PAS writing, without necessarily reducing the perceived time-intensity of the process (Kim & Baek, 2013).

Qualitative findings further suggest that complexity is experienced most strongly when standardised documentation is not embedded into clinical systems. In such contexts, EHR adaptations incorporating PAS drop-down lists for NCP or IDNT appeared to act as a stronger facilitator of implementation than peer support alone (O'Sullivan, 2013).

Overall, the evidence indicates that standardisation in dietetic practice is most sustainable when supported by professional guidance, including endorsement from national dietetic associations (NDAs), peer support, leadership reinforcement, and documentation systems designed to integrate NCP components efficiently into routine practice.

2.4 Documentation Practices in Dietetics

2.4.1 Importance of documentation for quality care and continuity

Documentation is central to delivering high-quality nutrition care and ensuring continuity across providers and settings. Across the literature, structured digital documentation environments, particularly those supported by electronic health records (EHRs), have been associated with improved documentation quality, higher practitioner confidence, and greater workflow efficiency. In contrast, manual or unstructured documentation formats are more frequently described as complex, inconsistent, and time-consuming, suggesting that documentation environment and infrastructure may meaningfully shape the reliability and usability of dietetic records in routine practice.

2.4.2 Variability in documentation practice across countries and settings

Documentation practice remains highly variable across countries and institutional contexts, reflecting differences in professional endorsement, implementation strategies, and system readiness. Multinational evidence demonstrated substantial divergence in awareness and uptake of NCP/NCPT, with lower awareness and weaker implementation generally reported in settings lacking strong infrastructural, educational, or professional support (Lovestam, Steiber et al., 2019). Even where awareness was high, implementation differed by setting, with greater uptake in inpatient environments than in public health contexts. National dietetic association recommendations, peer support, and EHR availability have all been identified as important facilitators, although their influence appears to vary between countries, suggesting that endorsement alone may be insufficient without parallel infrastructural and educational support.

2.4.3 Current documentation tools (manual or electronic)

Current documentation tools in dietetics appear in both manual and electronically supported formats, with adoption shaped by the extent to which systems can support structured recording. Evidence from Sweden illustrates how workplace-level implementation conditions affect documentation behaviour. Where EHR systems incorporated drop-down lists and preformatted

PAS statement options, NCP/NCPT use aligned more easily with clinical workflow and became more sustainable than in settings relying on individual motivation or informal support alone (Lovestam et al., 2017; Lovestam, Steiber et al., 2019). Similarly, in Australia and the wider Asia-Pacific region, survey-based findings indicated that although dietitians frequently recognised the theoretical value of structured documentation for reasoning, communication, and patient care, the perceived time burden remained (O'Sullivan et al., 2019).

Taken together, these findings suggest that documentation practices in dietetics are shaped not only by professional knowledge or perceived usefulness, but also by structural feasibility, training availability, peer and organisational reinforcement, and the capacity of electronic systems to operationalise NCP/NCPT documentation in routine practice.

2.5 Digital Tools and e-Health in Nutrition Practice

Given the limited number of directly relevant digital implementation studies within dietetic practice, evidence from adjacent healthcare professions was also considered to contextualise the potential impact of electronic documentation systems. In nursing settings, electronic formats have consistently demonstrated improvements in documentation completeness, clarity, and care planning quality compared with paper-based records. For example, Jin et al. (2021) and Wang et al. (2013) reported significantly higher completeness and comprehensiveness scores for electronic documentation relative to manual formats, with nurses documenting more consistently when structured digital templates were available. Similarly, Ammenwerth et al. (2001) found that computer-based nursing documentation improved the overall quality and clarity of care plans, despite a modest increase in time investment due to more detailed entries.

Additional evidence from clinical monitoring tools further supports the benefits of digital systems. Tomasi et al. (2020) observed fewer scoring errors and improved decision-making accuracy when using an electronic version of the Bedside Paediatric Early Warning System compared with paper charts. Likewise, Snowdon et al. (2015) reported fewer skipped items and improved completion rates when comparing electronic and traditional formats of the Montreal Cognitive Assessment, suggesting that structured digital design may enhance data reliability and user guidance.

Although these studies originate outside nutrition and dietetics, their findings are conceptually relevant. They suggest that electronic documentation systems may promote greater standardisation, accuracy, and consistency in clinical recording, all of which align closely with the objectives of the NCP framework. As such, these cross-disciplinary findings provide supportive evidence for the potential value of software-based NCP implementation in dietetic practice.

2.6 Impact of Digital Tools on Workflow, Accuracy, and Efficiency

Across international studies, the availability of electronic health record (EHR) systems capable of integrating the NCP has been associated with higher implementation rates, improved documentation quality, enhanced practitioner confidence, and greater workflow efficiency (O'Sullivan, 2013; Lövestam et al., 2020). Digital systems that embed structured assessment fields, diagnosis templates, and standardised terminology reduce reliance on free-text narrative entries and promote more consistent application of the NCP framework.

From a workflow perspective, electronic documentation can streamline the sequencing of clinical tasks by guiding practitioners through predefined steps aligned with PNDP/NCP logic. When assessment data fields, diagnostic statements, and monitoring indicators are integrated within a single interface, cognitive load may be reduced and documentation may become more structured and less fragmented. Studies examining NCP integration into electronic systems report improved perceived efficiency, particularly when templates are aligned with clinical reasoning pathways (O'Sullivan, 2013). Conversely, poorly designed systems may increase time burden, highlighting the importance of usability and workflow compatibility.

With regard to documentation accuracy and completeness, evidence from adjacent healthcare professions—particularly nursing—provides robust support for electronic documentation systems. Systematic reviews in nursing have demonstrated that electronic documentation improves legibility, reduces omission errors, enhances completeness of clinical records, and supports more accurate care planning (Wang et al., 2011; Kelley et al., 2011). Electronic systems that use structured fields and standardised terminology decrease ambiguity and variation in documentation, thereby improving reliability of recorded data. These findings are transferable to dietetics, where clarity of nutrition diagnoses and intervention rationales is essential for continuity of care and interdisciplinary collaboration.

Electronic systems also facilitate data retrieval and audit functionality. Structured digital documentation enables aggregation of coded entries, allowing institutions to evaluate adherence to guidelines, identify practice variation, and monitor outcome trends. This capacity is particularly relevant in the context of implementation science, where fidelity to structured frameworks such as the NCP must be measurable rather than assumed (D'Amore et al., 2021). Without electronic integration, systematic audit of documentation quality becomes labour-intensive and inconsistent.

Efficiency gains associated with digital tools extend beyond time savings. Electronic integration can reduce duplication of data entry, minimise transcription errors, and support interoperability across multidisciplinary teams. When nutrition documentation is visible within shared health records, it enhances professional visibility and strengthens the dietitian's role in coordinated care pathways (Swan et al., 2017). Moreover, standardised electronic entries can support secondary uses of data, including research, service evaluation, and policy planning.

However, the impact of digital tools is not universally positive and depends heavily on system design, training, and organisational support. Research indicates that insufficient training, poorly adapted templates, and lack of workflow alignment may negate potential efficiency benefits (O'Sullivan, 2013). Therefore, the effectiveness of electronic NCP implementation is contingent upon both technological infrastructure and practitioner acceptance.

Collectively, the literature supports the integration of an electronic NCP/PNDP model that combines structured documentation logic with flexibility to accommodate diverse clinical scenarios. Digital tools that embed standardised terminology while remaining adaptable to workflow demands may enhance accuracy, transparency, and efficiency, provided they are contextually tailored and supported by adequate training and governance mechanisms.

2.6.1 Barriers to Adoption (Cost, Digital Literacy, and Resistance to Change)

Barriers to the adoption of PNDP/NCP frameworks and associated electronic documentation tools are consistently described in the literature as predominantly practical and organisational rather than conceptual. That is, resistance rarely stems from disagreement with the theoretical value of structured nutrition care, but rather from the perceived effort, time burden, and workflow disruption associated with implementation. Across diverse international settings, the most frequently reported constraint is the additional time required to complete structured documentation, particularly during early stages of adoption when practitioners are still developing fluency with standardised terminology and Problem–Aetiology–Signs/Symptoms (PAS) diagnostic statements (Kim & Baek, 2013; Lovestam, Vivanti et al., 2019; Vivanti et al., 2018).

At the individual practitioner level, insufficient training and limited familiarity with structured diagnostic language can create uncertainty and reduce confidence in applying the framework consistently. Even when dietitians express positive attitudes toward the NCP conceptually, a lack of practical competence in formulating nutrition diagnoses or linking assessment data to measurable outcomes may hinder routine integration (Lovestam, Vivanti et al., 2019). This gap between theoretical endorsement and operational fluency highlights the importance of structured education and ongoing professional development in sustaining implementation efforts.

Organisational factors further influence adoption dynamics. Studies demonstrate that managerial endorsement, peer reinforcement, and protected time for documentation significantly shape implementation outcomes (Lovestam et al., 2017; Vinci et al., 2023). In environments where leadership does not actively support structured documentation, or where productivity pressures prioritise patient volume over documentation quality, practitioners may revert to established habits perceived as more efficient. Resistance to change in such contexts is often less about disagreement with the framework and more about perceived incompatibility with existing routines. Moreover, when the added value of structured documentation is not clearly communicated or visibly linked to improved outcomes, motivation to adopt new practices may diminish.

Digital implementation introduces additional layers of complexity. Financial constraints related to software development, system integration, and maintenance may limit institutional willingness to invest in specialised nutrition documentation tools. Infrastructure limitations—such as lack of interoperability with existing EHR systems, restricted access to devices, or limited technical support—can reduce feasibility and increase frustration among users (O'Sullivan, 2013; Vinci et al., 2023). In some settings, dietitians report restricted permissions within electronic systems compared to other healthcare professionals, further constraining their ability to document comprehensively.

Digital literacy also plays a significant role. Variability in technological competence, particularly among practitioners trained in predominantly paper-based systems, can exacerbate resistance during early transition phases. Workflow disruption during system implementation—characterised by slower documentation speed, navigation difficulties, and template unfamiliarity—may temporarily reduce perceived efficiency and reinforce scepticism (O'Sullivan, 2013). Without structured onboarding, technical support, and iterative system refinement, such initial challenges can undermine long-term adoption.

Importantly, the literature suggests that adoption becomes more sustainable when barriers are addressed through coordinated strategies that reduce effort and uncertainty. Comprehensive training programmes, leadership engagement, peer mentorship, and the integration of user-friendly EHR templates aligned with PNDP/NCP logic significantly improve uptake and long-term adherence (Lovestam, Vivanti et al., 2019; O'Sullivan, 2013). When electronic systems are designed to mirror clinical reasoning pathways rather than impose rigid administrative demands, practitioners are more likely to perceive added value and integrate structured documentation into routine practice.

Overall, the evidence indicates that resistance to PNDP/NCP adoption is rarely ideological; instead, it reflects the interaction between workload pressures, technological infrastructure, professional culture, and organisational governance. Sustainable implementation therefore requires not only conceptual endorsement of structured care models, but also systemic alignment of training, digital functionality, leadership support, and workflow integration.

2.7 Usability and Acceptance of Digital Tools

2.7.1 User perceptions: usability, perceived usefulness, intention to use

The usability and acceptance of digital tools for NCP documentation were primarily reflected through user-reported perceptions, implementation drivers, and reported barriers and enablers relating to electronic integration. Across the included studies, perceived usefulness and intention to use were indirectly captured through reported benefits such as documentation standardisation, improved workflow efficiency, improved communication, as well as through adoption patterns associated with access to electronic health records (EHRs), organisational endorsement, and peer support.

Evidence from multinational implementation work (Lovestam, Steiber et al., 2019; Vinci et al., 2023) suggests that acceptance of NCP/NCPT is strongly influenced by facilitating infrastructure and social-professional reinforcement. In the INIS survey, the availability of EHRs was reported as a key enabler (55%), alongside peer support (63%) and recommendations from national dietetic associations (69%). These findings indicate that perceived usefulness and feasibility of adoption are closely tied to whether electronic systems support structured documentation. Similarly, in the Swiss re-analysis (Vinci et al., 2023), awareness was almost universal (99%), and frequent use was reported by most participants (72%), with peer support and national association influence again emerging as the strongest enabling factors. Importantly, access to EHRs differed substantially between language groups (81% German vs 44% French; $p < 0.001$), supporting the view that usability and acceptance are partially contingent on practical access to and compatibility of digital documentation systems. Across both studies, time constraints and inadequate training/knowledge remained prominent barriers, consistent with reduced behavioural intention when the perceived effort required remains high.

More explicitly usability-oriented insights were drawn from national and institutional tool evaluation studies. Vivanti et al. (2018) demonstrated that while knowledge, familiarity, and confidence improved over time, perceived burden did not, with the time-consuming nature of NCP/NCPT remaining the strongest disabling factor across both data collection points. This persistence suggests that acceptance may remain limited when usability and efficiency are not sufficiently improved at the point of use. In parallel, O'Sullivan et al. (2019) reported that although most participants considered the NCP applicable to their practice (81.7%), fewer reported current use (65.1%), and a proportion still characterised implementation as inconvenient (19.6%). Resistance was strongly linked to lack of training or support and insufficient time, again aligning with acceptance patterns typically observed where perceived effort outweighs perceived benefit.

Qualitative case studies on workforce readiness further support the central role of system usability and workflow integration. In Sweden, Lovestam et al. (2017) documented that implementation became more feasible when the EHR could be modified to accommodate NCP-related terminology, particularly through drop-down lists and preformatted PES statements, features that dietitians reported as practically helpful. In Case B, despite peer support and leadership, resistance persisted until the EHR system was updated to include drop-down PES options, suggesting that integration into routine workflow may be a stronger facilitator of acceptance than peer influence alone. Conversely, the solitary practitioner in Case C reported that the inability to format the EHR, combined with lack of peer support and limited resources, reinforced continued use of traditional documentation due to speed and convenience.

2.7.2 Case studies on tool testing and user evaluation in dietetic contexts

Tool testing and direct user evaluation were most clearly represented in O'Sullivan (2013), who developed and evaluated an electronic NCP/NCPT prototype. The prototype incorporated structured menus, ready-to-select diagnoses, and intervention options, although follow-up documentation was not fully functional due to budget constraints. Evaluation methods included questionnaires, pre–post testing (n = 12), and a focus group (n = 7). Participants identified benefits linked to standardisation (83%) and a systematic approach (75%), while the strongest barrier was lack of education and training (86%), with the remainder emphasising time burden (14%). Importantly, participants consistently preferred the electronic format over paper due to ease of use, retrospective accessibility, integration with EHR systems, and time efficiency. Confidence in using the NCP increased by 17% after prototype use, and participants also described the tool's potential training value through step-by-step guidance that supported clinical reasoning. Overall, most participants reported being more likely to adopt electronic documentation.

Finally, regional case studies highlight how acceptance may vary depending on local training exposure and perceived practicality. Kim & Baek (2013) showed high awareness and training exposure among Korean hospital managers, yet many still rated knowledge as moderate or poor, and perceived insufficient knowledge as a barrier to implementation even in settings already adopting NCP. In contrast, Alkhaldy et al. (2020) reported high awareness among Saudi dietitians despite limited formal training, with many participants self-rating as competent users and reporting widespread NCP use. Notably, participants did not broadly describe NCP as time-consuming; instead, barriers were workforce size, experience/knowledge, and workflow disruption—suggesting that where usability is perceived as manageable, intention to use may remain high even in the absence of extensive formal training.

Collectively, these findings indicate that acceptance of digital NCP tools is shaped by perceived usefulness (standardisation, improved workflow, accessibility), perceived ease of use (drop-down lists, integration into EHRs, structured menus), and supporting conditions such as training, peer or association endorsement, and infrastructure. Across studies, usability barriers were consistently linked to time demands and training deficits, whereas acceptance increased when electronic systems reduced documentation effort and aligned with routine clinical workflows.

2.8 The Cypriot Context

2.8.1 Status of Dietetic Practice in Cyprus and National Initiatives

Despite the growing international body of evidence supporting structured documentation frameworks and electronic integration of the NCP, there remains a marked paucity of empirical research examining implementation within the Cypriot healthcare system. Cyprus represents a small, mixed public–private health system that has undergone substantial structural reform in recent years, particularly through the phased implementation of the General Health System (GHS/ΓΕΣΥ). Although this reform has introduced a unified electronic health record (EHR) platform intended to standardise healthcare delivery across the country, structured nutrition documentation within this system remains limited in scope and largely dependent on manual or locally adapted approaches. Consequently, understanding implementation within this specific regulatory, infrastructural, and professional environment is essential before extrapolating international findings derived from larger or more digitally mature systems.

From 2025 onwards, the profession of dietetics in Cyprus is formally protected under Law 31(I)/96, with additional proficiency standards defined by the national regulatory authority, the Cyprus Council for the Registration of Food Scientists, Technologists and Dietitians (CyRBFSTD), and aligned with the European Professional Qualifications Directive 2005/36/EC (CYQAA, 2025; Ministry of Energy, 2020). This legislative framework establishes dietetics as a regulated healthcare profession, reinforcing accountability, professional autonomy, and alignment with European standards of competency and training. Dietitians may operate independently in private practice or within the national health system (GHS), providing services to both inpatients and outpatients across public and contracted private healthcare settings.

Current demographic data from Cyprus Dietetic and Nutrition Association (CyDNA) registrations reflect a substantial and geographically distributed professional base. The registry includes 321 clinical dietitians, 271 dietitians, 11 sports dietitians, 40 nutritionists, and 107 students, with average ages ranging from 27 years (students) to 37 years (dietitians). It is noted that some students registered as clinical dietitians are additionally listed under the dietitian category, suggesting overlapping registration pathways during professional transition. Within the GHS framework, the distribution of registered dietitians across districts indicates both clustering and nationwide coverage, with the highest concentration in Nicosia (146), followed by Limassol (87), Larnaca (48), Paphos (31), and Famagusta (16), totalling 322 registered professionals within the public system. This distribution highlights the presence of an established but relatively small workforce, operating within a nationally standardised yet evolving digital infrastructure.

While international findings provide valuable insight into facilitators and barriers influencing NCP implementation—such as national association endorsement, peer support, and EHR integration (D'Amore et al., 2021; Swan et al., 2017), little is known about how such dynamics operate within small Mediterranean health systems such as Cyprus. Unlike countries where NCP/NCPT implementation has been formally embedded into electronic systems or explicitly mandated by national professional bodies, Cyprus has only recently completed large-scale health system reform through the introduction of the GHS. The digital infrastructure of the GHS remains under progressive development, and current functionality provides limited structured templates specific to nutrition documentation (OAY, 2020). As a result, dietitians' documentation practices may vary considerably, depending on institutional support, individual initiative, or local adaptations.

Importantly, no published studies to date have systematically examined dietitians' use of the Process for Nutrition and Dietetic Practice (PNDP), standardised language systems, or digital documentation tools within the Cypriot context. This absence of empirical data represents a critical gap in the literature. Given that digital systems are recognised as enabling structured clinical reasoning, interprofessional communication, and measurable outcome reporting (D'Amore et al., 2021; Swan et al., 2017), the lack of context-specific evidence limits both policy development and professional standardisation efforts at national level.

At the regulatory level, documentation-related requirements for nutrition and dietetic professionals (NDPs) operating within the GHS have begun to formalise expectations around record-keeping. Anthropometric data recording is explicitly mandated in patients' health records, as specified in the GHS announcement published in July 2023 (Appendix I: GHS announcement ID 072023AHCP00330), which outlines structural requirements for documentation through the national platform. Furthermore, an earlier GHS announcement (Appendix II: GHS announcement ID DIET20220201), published in February 2022 and accessible via the CyDNA platform, requires that any GHS-affiliated NDP seeking approval to exceed the maximum permitted number of annual patient visits must complete and submit a structured document in which PNDP components are included. These directives signal a gradual institutional alignment toward structured documentation frameworks, even in the absence of a fully integrated digital PNDP tool.

However, the practical translation of these mandates into routine clinical behaviour remains unclear. Although the present study's questionnaire does not specify the proportion of participants affiliated with the GHS, preliminary findings suggesting that some NDPs may perceive anthropometric data collection as independent, optional, or clinically peripheral is noteworthy. Such perceptions are inconsistent with nationally mandated documentation requirements and diverge from international practice standards, where anthropometric assessment is routinely embedded within structured clinical documentation frameworks and job role specifications (*Dietetic assistant practitioner - job announcement,* 2024). While anthropometric assessment may indeed be clinically inappropriate or technically challenging in certain cases—such as acute illness, limb amputation, or severe oedema—these exceptions require explicit documentation within a structured format to ensure continuity, clarity, and professional accountability (Casadei & Kiel, 2025).

Taken together, the Cypriot context presents a paradox: a legally regulated profession operating within a nationally digitised health system, yet lacking a validated, standardised electronic framework for structured nutrition documentation. This misalignment between regulatory expectations, digital infrastructure, and practical implementation underscores the need for empirical investigation. Evaluating the current state of documentation practice, professional perceptions, and the feasibility of a context-adapted electronic PNDP tool is therefore essential to inform policy development, professional training, and future digital integration strategies within Cyprus.

2.8.2 Gaps in PNDP Use, Training, and Digital Infrastructure

At present, there are no validated, standardised electronic tools specifically designed for nutrition care documentation within the Cypriot healthcare system. Although clinical dietitians operating within the General Health System (GHS/ΓΕΣΥ) are required to produce structured patient notes within the national electronic platform, their access to patient data and documentation functionality remains comparatively limited in relation to other healthcare professionals. The electronic system provides restricted structured fields for nutrition documentation, and does not incorporate a fully integrated PNDP-based framework. As a result, dietitians often rely on hybrid approaches that combine mandatory digital entry with supplementary manual or locally adapted documentation methods.

This structural limitation has broader implications beyond documentation mechanics. Restricted digital integration may reduce the visibility of dietitians' clinical reasoning, obscure the measurable contribution of nutrition interventions to patient outcomes, and limit interprofessional recognition of dietetic expertise. In health systems where structured documentation is digitally embedded, nutrition diagnoses, interventions, and outcomes can be systematically recorded, retrieved, and audited. In contrast, where structured PNDP functionality is absent, documentation may become fragmented, narrative-based, or inconsistent, thereby constraining data-driven evaluation and interdisciplinary transparency.

In addition to technological constraints, training and competency evaluation mechanisms related to structured documentation appear limited at national level. While dietetic education aligns with European professional qualification standards (CYQAA, 2025; Ministry of Energy, 2020), there is currently no formalised, nationally standardised audit system specifically assessing PNDP implementation fidelity, documentation quality, or structured language use within the GHS. This gap may result in variability across practitioners and institutions, particularly in the absence of routine monitoring, benchmarking, or structured feedback mechanisms.

Furthermore, current audit structures within the GHS primarily prioritise financial governance, service utilisation, and regulatory compliance. Although these measures are essential for system sustainability, the systematic collection and analysis of quality-of-care indicators specific to dietetic practice remain limited. The absence of routine competency assessment, structured quality metrics, or dedicated compliance monitoring teams for guideline implementation may inadvertently allow flexibility in documentation practices, leading to potential inconsistency in the application of structured frameworks such as PNDP.

Taken together, the Cypriot context reflects a multi-layered implementation gap: regulatory recognition of the profession exists; digital infrastructure is operational but incomplete; and quality governance mechanisms do not yet fully incorporate structured documentation metrics. This misalignment between professional standards, digital capability, and quality monitoring underscores the need for empirical evaluation of documentation practices and the feasibility of structured electronic tools tailored to the national context.

2.8.3 Relevance of Standardisation and Digital Documentation to the Local Context

The limited systematic collection of dietetic quality-of-care data within the Cypriot health system highlights the strategic importance of standardised documentation approaches capable of generating structured, comparable, and auditable information. In healthcare environments undergoing digital transition, structured documentation frameworks serve not only as clinical reasoning tools but also as instruments of accountability, performance evaluation, and service optimisation.

Recent policy discussions within Cyprus have increasingly emphasised the introduction of quality criteria linked to compensation structures and the broader adoption of clinical management guidelines across healthcare professions (Theodorou et al., 2025). These developments signal a shift toward performance-based governance and outcome-oriented healthcare delivery. Within such a framework, the absence of structured nutrition documentation systems may limit the ability of dietitians to demonstrate measurable contribution to patient management, cost-effectiveness, and quality improvement.

Standardisation through PNDP and associated structured terminology offers a mechanism to address this gap. By embedding consistent documentation pathways within digital systems, it becomes possible to:

- Monitor adherence to evidence-based nutrition interventions
- Facilitate benchmarking across districts or institutions
- Support interdisciplinary communication
- Enable aggregation of anonymised outcome data for audit and research purposes

In small health systems such as Cyprus, where workforce size is relatively limited and digital infrastructure is centrally coordinated, the implementation of a validated electronic PNDP tool may offer disproportionate systemic benefit. Structured digital documentation could enhance transparency, strengthen professional visibility, and align dietetic services with emerging national quality governance frameworks.

Moreover, as compensation models and clinical management guidelines increasingly incorporate quality indicators (Theodorou et al., 2025), structured documentation becomes not merely a professional preference but a strategic necessity. Without consistent and digitally integrated frameworks, it becomes difficult to objectively evaluate service quality, identify gaps in practice, or support continuous professional development initiatives.

Therefore, within the Cypriot context, standardisation and digital documentation are not solely matters of administrative efficiency; they represent foundational components of professional maturation, health system accountability, and sustainable integration of dietetic services within a digitally evolving healthcare environment.

2.9 Research Gaps and Rationale for This Study

2.9.1 Summary of Unresolved Issues in the Literature

The international literature demonstrates growing support for structured documentation frameworks such as the NCP and associated terminology systems. Across studies, the availability of electronic health record (EHR) systems capable of accommodating the NCP has been consistently associated with higher implementation rates, improved documentation quality, greater practitioner confidence, and enhanced workflow efficiency. In contrast, handwritten or unstructured documentation formats are frequently described as complex, time-consuming, and difficult to audit. Commonly reported barriers include limited training, insufficient time, technological constraints, and workflow incompatibility, whereas enablers include national association endorsement, peer collaboration, leadership support, and EHR integration.

Despite this growing body of evidence, several unresolved issues remain. Much of the existing research is methodologically limited. Most studies use cross-sectional survey designs and rely on self-reported perceptions of implementation rather than objective measures of documentation behaviour.

Relatively few investigations incorporate mixed-method designs capable of examining both measurable implementation patterns and experiential dimensions of adoption. Longitudinal and evaluative studies also remain limited.

Second, the literature has not consistently examined documentation format as an implementation variable in its own right. Although electronic systems are frequently described as facilitating adoption, the mechanisms through which documentation environment influences usability, reasoning processes, workflow integration, and sustained implementation remain insufficiently explored. As a result, the literature offers useful descriptive insight, but limited explanatory depth regarding the conditions under which structured documentation becomes practically sustainable.

Third, implementation research in dietetics remains only loosely connected to broader implementation science perspectives. Although barriers and enablers are commonly reported, they are often presented descriptively rather than interpreted through structured models of organisational change, digital adoption, or professional behaviour. Consequently, the interaction between technological infrastructure, organisational readiness, leadership support, and practitioner engagement remains under-theorised.

Taken together, these limitations indicate that the field still requires methodologically stronger and more conceptually integrated research capable of examining structured nutrition documentation not only as a professional standard, but also as an implementation process shaped by documentation environment, organisational context, and user experience.

2.9.2 Lack of Validated Digital PNDP Tools Tailored to Local Practice

A significant contextual gap exists in relation to Cyprus. There are currently no validated digital tools specifically designed to operationalise the PNDP framework within the Cypriot healthcare system. Although a national electronic health record system is established under the General Health System (GHS), nutrition documentation within this environment remains only partially structured and does not incorporate a fully integrated PNDP-based workflow.

While dietitians are able to store information as written clinical or personal notes, documentation is typically entered into unrestricted text fields without predefined PNDP-aligned structure. There is no embedded template that systematically guides practitioners through assessment, diagnosis, intervention, and monitoring steps. Although guidance from the Cyprus Dietetic and Nutrition Association (CyDNA) provides recommendations regarding documentation format, adherence remains highly variable across practitioners and institutions, depending on local routines, individual preferences, and the extent of institutional support.

This absence of a structured electronic PNDP tool creates several implications. First, variability in documentation format may limit consistency and comparability of care. Second, free-text documentation reduces the potential for data aggregation, audit, and quality monitoring. Third, the lack of integrated diagnostic prompts may weaken explicit articulation of clinical reasoning pathways. More broadly, the absence of a validated and contextually adapted digital tool limits opportunities to examine how structured digital support may influence implementation experience within local practice conditions. This, in turn, restricts the capacity to monitor implementation quality, benchmark practice, and demonstrate the contribution of dietetic care within a digitally evolving health service.

Therefore, the Cypriot context represents not merely a geographical gap in the literature but a structural implementation gap, where professional standards exist without corresponding digital operationalisation. This gap provides a direct rationale for developing and evaluating a contextually adapted electronic PNDP tool.

2.9.3. Need for Studies Assessing Clinical Usability and Professional Perceptions

Although PNDP is increasingly referenced in professional standards and regulatory frameworks, empirical research directly evaluating its implementation and experiential use remains limited. Much of the existing evidence derives from studies of the closely aligned NCP and NCPT, rather than PNDP specifically. Furthermore, studies frequently rely on self-reported attitudes or perceived barriers without systematically examining usability dimensions such as cognitive load, workflow integration, interface clarity, and time efficiency.

Evidence suggests that adoption is strongly influenced by usability factors, including perceived time burden, alignment with routine workflow, adequacy of training, and clarity of diagnostic structures. Professional perceptions of usefulness and feasibility vary significantly across settings and are often shaped by organisational support and technological maturity rather than conceptual acceptance of structured care alone.

However, few studies have examined:

- How practitioners experience structured documentation in contexts where digital support is absent, partial, or newly introduced.
- Whether digital tools support or constrain the visibility and practical expression of clinical reasoning.
- How usability influences long-term sustainability of implementation.
- How small health systems without mature digital templates adapt structured frameworks.

In contexts such as Cyprus, where structured digital tools are not yet available or validated, these questions become particularly relevant. Applied research assessing real-world usability, professional perceptions, and implementation feasibility is therefore necessary to bridge the gap between theoretical endorsement of structured frameworks and practical integration into daily clinical workflow.

The present study addresses these gaps by (1) examining current documentation practices and perceptions within the Cypriot context, with particular focus on PNDP, (2) developing and evaluating a contextually adapted electronic PNDP tool, and (3) examining usability- and implementation-relevant perceptions through a mixed-method approach within a small, digitally evolving health system. In doing so, it contributes both empirical and applied insight to the implementation science of structured nutrition documentation.

To synthesise the preceding discussion, Table 2.2 summarises the key research gaps identified in the literature and their relevance to the present study.

Table 2.2: Synthesised framework of key research gaps underpinning the present study.

Gap domain	Main gap identified in the literature	Why it matters	How the present study responds
Conceptual gap	Documentation format has not been consistently examined as an implementation variable in its own right.	Limits understanding of how manual versus electronic formats influence reasoning, consistency, and implementation fidelity.	Examines the role of documentation format in structured nutrition documentation and explores the value of an electronic PNDP format.
Methodological gap	Much of the literature is cross-sectional, descriptive, and based on self-reported perceptions, with limited mixed-method or evaluative research.	Restricts causal inference and weakens understanding of implementation in real-world settings.	Uses a mixed-method approach to examine documentation practices, perceptions, and tool evaluation.
Usability and implementation gap	Few studies examine how workflow fit, usability, training, and digital support shape sustained adoption of structured documentation.	A framework may be conceptually valued but remain difficult to apply in routine practice.	Investigates barriers, facilitators, and usability-relevant perceptions, and evaluates a context-adapted electronic PNDP tool.
Cyprus-specific contextual gap	No validated electronic PNDP tool and very limited empirical evidence on structured documentation	Creates a local implementation gap between professional standards and digital operationalisation.	Provides Cyprus-specific evidence and develops a context-adapted electronic PNDP tool tailored to

	practices within Cyprus.		local practice conditions.

2.10 Conclusion

This chapter critically examined the international implementation of the NCP and related documentation frameworks across a range of documentation environments, including manual, unstructured, and electronically supported formats. Through a PRISMA-guided systematic review and narrative synthesis, the literature demonstrates that electronic integration of structured nutrition documentation is generally associated with improved documentation quality, enhanced practitioner confidence, increased auditability, and greater workflow efficiency. In contrast, manual or unstructured documentation formats are frequently described as time-intensive, inconsistent, and difficult to monitor systematically.

However, despite widespread conceptual endorsement of structured nutrition care, several unresolved issues persist. The literature has not consistently examined how documentation environment and digital support may shape implementation fidelity, usability, and clinical reasoning in practice. Methodologically, the evidence base remains dominated by cross-sectional survey designs, with limited mixed-method evaluations and few studies involving the development and empirical validation of contextually adapted digital tools. Furthermore, the integration of implementation science frameworks remains underdeveloped, resulting in insufficient understanding of how organisational context, digital infrastructure, professional identity, and workflow dynamics interact to influence sustainable adoption.

Within the Cypriot context, these gaps are particularly salient. Although the dietetic profession is legally regulated and embedded within a national electronic health system, structured PNDP-based documentation is not digitally operationalised through validated templates. Existing audit mechanisms primarily address financial and regulatory compliance, while systematic measurement of documentation quality and clinical reasoning processes remains limited. Recent policy developments, including the introduction of quality criteria linked to compensation and the adoption of clinical management guidelines, further emphasise the growing importance of structured, auditable documentation practices in the local healthcare environment. Taken together, the literature underscores a critical need for context-sensitive research that examines how documentation systems and digital support influence implementation experience, structured digital tools within evolving healthcare systems. Addressing these gaps requires a research design capable of integrating quantitative assessment of implementation patterns with qualitative exploration of practitioner experience. Accordingly, the following chapter outlines the methodological framework adopted in this study, detailing the research design, sampling strategy, instrument development, validation procedures, and analytic approach used to examine current documentation practices, professional perceptions, and the development and evaluation of a context-adapted electronic PNDP tool within the Cypriot healthcare context.

CHAPTER 3 PHILOSOPHY, METHODOLOGY AND METHODS

3.0 Introduction

The preceding chapter demonstrated substantial international variation in the implementation of structured nutrition documentation frameworks, particularly in relation to manual and electronic formats. While the theoretical and professional benefits of standardised processes such as the PNDP/NCP are consistently described across settings, including improved documentation clarity, enhanced clinical reasoning, and strengthened interdisciplinary communication, their practical integration remains uneven. Evidence suggests that sustainability and long-term adherence are more frequently achieved when structured documentation is embedded within electronic systems. However, contextual, organisational, and usability factors significantly influence implementation outcomes.

In the Cypriot context, no validated electronic PNDP tool currently exists, and structured documentation practices vary across practitioners and institutions. Given the legal regulation of the profession, the nationwide implementation of the General Health System (GHS), and emerging policy emphasis on quality indicators, empirical investigation of documentation format, usability, and professional perceptions is both timely and necessary.

This study therefore aimed to examine the implementation of PNDP-based documentation among nutrition and dietetic professionals practising in Cyprus, whether affiliated with the GHS or operating independently, and to use these findings to inform the development and refinement of a context-appropriate electronic PNDP tool. Including practitioners across sectors enabled a comprehensive assessment of documentation practices within the national professional landscape and ensured that the study captured the variability in documentation habits, workflow constraints, and digital infrastructure across settings.

Methodologically, the study was implemented in sequential stages. In the first stage, an online questionnaire (Appendix III) was administered to describe current documentation practices, perceived challenges, and attitudes toward structured documentation, generating an empirical baseline of implementation conditions in Cyprus. These findings were then used formatively to guide the second stage the development of the electronic PNDP tool (e-ΔΔΔΦ). Tool development translated the PNDP into a structured digital workflow in Greek, with design decisions explicitly shaped by the needs and constraints highlighted in the initial survey (e.g., emphasis on usability, workflow fit, and reduction of free-text burden).

In the third stage, the prototype tool underwent expert validation via an online validation questionnaire (Appendix IV), designed to obtain structured appraisal and actionable feedback on the tool's content and presentation. Training and orientation elements were embedded within the validation process to support informed judgement; experts were provided with explanatory material and exposure to the tool to understand its structure, intended workflow, and key functions before completing the evaluation. The validation instrument collected quantitative ratings and qualitative feedback focusing on core criteria relevant to early-stage tool validation (relevance, clarity, and simplicity), alongside usability-related reflections through open-ended input fields. Findings from this expert review were used iteratively: recurrent recommendations and identified gaps were prioritised and incorporated into revisions to improve the tool's content completeness, terminology, interface readability, and perceived feasibility for routine practice.

The final stage of the study culminated in the production of the refined, final version of e-ΔΔΔΦ. This final prototype reflects a structured development pathway in which baseline practice data informed tool design, expert validation, with embedded training components, supported systematic appraisal, and iterative changes were implemented to strengthen contextual fit, conceptual fidelity to PNDP, and usability for potential adoption within the Cypriot healthcare environment, such as the GHS.

Building on the conceptual, methodological, and contextual gaps identified in Chapter 2, this chapter outlines the research design adopted to investigate documentation practices and perceptions, and to support the development and evaluation of a context-appropriate electronic PNDP tool within a real-world healthcare environment. The methodological approach integrates quantitative and qualitative components to capture both measurable implementation patterns and experiential dimensions of digital documentation adoption.

3.0.1 Research Philosophy

This study adopts a pragmatic research philosophy, integrating both constructivist and positivist paradigms. This duality allows the combination of measurable data and subjective experiences, fitting the study's mixed-methods design. Pragmatism is particularly suited to research questions that seek practical solutions to real-world problems, as it prioritises the research question over strict adherence to a single philosophical tradition. Rather than assuming that knowledge is exclusively objective or purely socially constructed, pragmatism acknowledges that different types of evidence may be required to address complex applied problems.

From a positivist perspective, this study recognises that aspects of PNDP implementation—such as documentation format, usability ratings, and adoption patterns—can be measured, compared, and statistically analysed. Quantitative data allow examination of relationships between variables, including documentation format (manual versus software-based), perceived efficiency, and professional confidence. This aligns with a post-positivist ontological stance that assumes an external reality exists but can only be understood imperfectly through systematic measurement.

Simultaneously, the study incorporates constructivist principles by acknowledging that professional perceptions, experiences of usability, and interpretations of structured documentation are shaped by individual context, organisational culture, and professional identity. The qualitative component therefore seeks to explore how practitioners make sense of PNDP implementation within their specific healthcare environment. Knowledge in this dimension is viewed as socially constructed and context-dependent.

The pragmatic approach enables the integration of these perspectives within a mixed-methods design. By combining quantitative analysis of implementation trends with qualitative exploration of practitioner experience, the study captures both structural patterns and experiential dimensions of digital documentation adoption. This is particularly relevant given that PNDP implementation is influenced not only by measurable infrastructure factors but also by professional attitudes, workflow compatibility, and organisational support.

Pragmatism further aligns with the applied nature of this doctoral research. The study does not aim solely to generate theoretical knowledge but also to inform practice, policy, and digital tool development within the Cypriot healthcare system. The philosophical stance therefore supports methodological flexibility while maintaining coherence between research questions, design, and analytical strategy.

To guide the methodological choices in this study, the key research questions and hypotheses are restated below, followed by a detailed description of the research design and procedures.

3.1 Methodological Orientation of the Study

The present doctoral study was designed to examine structured nutrition documentation within the Cypriot dietetic context and to support the development and validation of a context-specific electronic PNDP tool. The broader aim, objectives, and research questions of the study have been presented earlier in the thesis. Therefore, this chapter does not restate them in full, but instead provides a brief methodological link between the study purpose and the research design adopted.

In summary, the study sought to investigate current documentation practices among nutrition and dietetic professionals in Cyprus, explore perceptions of structured documentation and standardised language, identify factors influencing the adoption of digital documentation, develop an electronic PNDP tool informed by local practice needs, and evaluate the tool through expert validation. These areas informed the selection of a pragmatic mixed-methods design, combining survey-based exploration, tool development, and expert review.

As the study was not designed as an interventional or comparative trial, formal hypotheses were not the primary driver of the methodology. Instead, the research was guided by exploratory and developmental research questions. Quantitative analyses were used where appropriate to describe patterns and examine selected associations, while qualitative feedback was used to enrich understanding of professional perceptions, implementation challenges, and practical acceptability of the electronic PNDP tool.

3.2 Study Design and Philosophical Framework across all PhD Phases

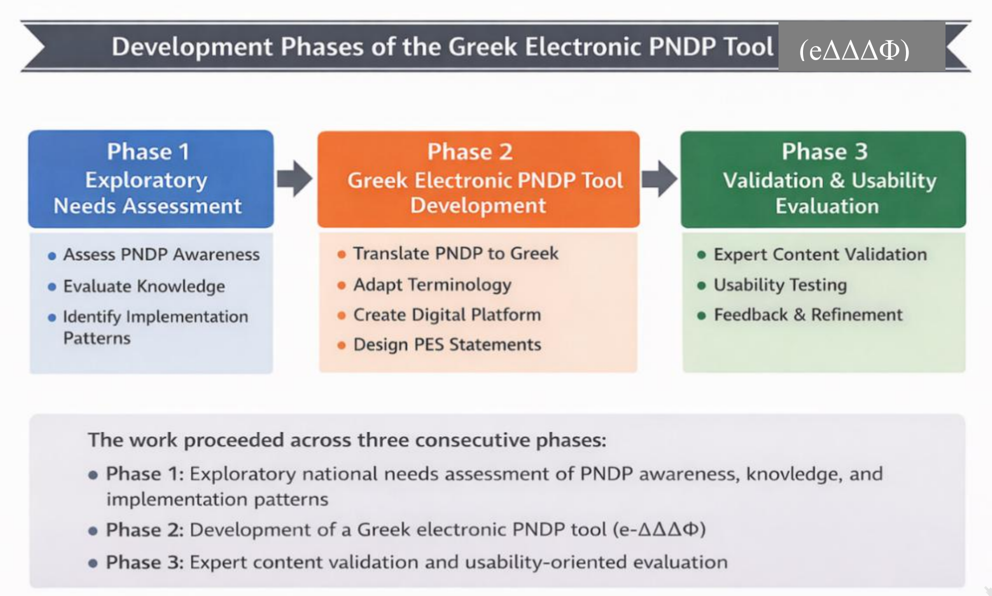
This study adopted a sequential, multi-phase mixed-methods design informed by a pragmatic research perspective. Pragmatism was considered suitable because the project addressed a real-world implementation challenge and required the complementary use of quantitative and qualitative evidence to guide iterative development and evaluate usability in context. The design deliberately connected three components: (i) an initial exploration of current documentation practices and implementation conditions, (ii) the development of a Greek digital workflow that operationalises the PNDP, and (iii) structured expert review to assess adequacy and support refinement. This combination strengthened both the empirical grounding of design decisions and the methodological robustness of the evaluation.

The work proceeded across three consecutive phases:

- Phase 1: Exploratory national needs assessment of PNDP awareness, knowledge, and implementation patterns
- Phase 2: Development of a Greek electronic PNDP tool (e-ΔΔΔΦ)
- Phase 3: Expert content validation and usability-oriented evaluation

This phased structure was intended to respond to locally identified practice, and digital infrastructure needs while ensuring that the final tool remained aligned with PNDP concepts and was refined through formal validation procedures (Figure 3.0).

Figure 3.0: Visual representation of research design.



3.2.1 Study Design, Participants, and Recruitment (Phase 1)

Phase 1 employed an exploratory cross-sectional online survey to document patterns of PNDP-related awareness, knowledge, and use among nutrition and dietetic professionals in Cyprus. Rather than aiming to produce population prevalence estimates, Phase 1 functioned as a needs assessment: it sought to identify variation in implementation, contextual influences, and documentation gaps that could directly inform the development priorities of the electronic tool in Phase 2.

Eligible participants were registered nutrition and dietetic professionals practising in Cyprus (including dietitians, clinical dietitians, nutritionists, with or without specialisations). Postgraduate and doctoral students undertaking supervised clinical placement were also eligible. Inclusion criteria required active involvement in nutrition and dietetic practice, fluency in Greek and/or English, and the ability to complete an online survey via an internet-enabled device.

Recruitment followed a convenience approach. Invitations were circulated through professional networks and dissemination channels, including the Cyprus Nutrition and Dietetic Association (CyDNA), professional mailing lists, and social media (email, Facebook, and Instagram). Participation was voluntary and anonymous, with an optional field allowing participants to provide contact details for possible involvement in subsequent phases.

Data collection took place between 28 November 2022 and 10 May 2025. Recruitment was conducted in two waves to increase participation. The instrument, eligibility criteria, and dissemination strategy were kept consistent across waves to preserve methodological continuity.

The Phase 1 questionnaire was developed by the research team to examine PNDP-related awareness, knowledge, and implementation behaviours among nutrition and dietetic professionals in Cyprus. It was designed as a framework-guided exploratory instrument (needs assessment) rather than a psychometric scale intended for construct measurement or formal validation.

Questionnaire content was structured around established professional frameworks. The NCP provided the primary organising logic through its four stages (Assessment, Diagnosis, Intervention, Monitoring and Evaluation) and principles of structured diagnostic reasoning (Swan et al., 2017; The Academy Quality Management Committee and Scope of Practice Subcommittee of the Quality, Management Committee, 2013). Additional guidance was drawn from the PNDP framework issued by the BDA, which operationalises NCP logic and EFAD principles on harmonised documentation informed the broader framing (BDA, 2021; Yuill, 2012). Evidence from implementation studies describing facilitators and barriers to structured documentation was also used to shape items related to feasibility and sustained uptake (O'Sullivan, 2013).

Accordingly, the instrument was conceptually anchored in established documentation models while being adapted to the linguistic and operational context of Cyprus. It was not copied from a previously validated EFAD questionnaire and was not presented as a validated psychometric measure.

The instrument included sections on: demographic and professional characteristics; familiarity with PNDP/NCP and other documentation approaches (including SOAP); perceived knowledge and confidence in structured documentation; patterns of routine versus selective implementation; challenges encountered across PNDP stages; the use of standardised language (e.g., PES statements); and perceived barriers and enablers affecting continued application in practice. Items were presented using categorical options, multiple-choice responses, Likert-type items, and open-ended prompts to capture both quantitative trends and contextual detail. Because Phase 1 was exploratory, subsequent analyses focused on descriptive mapping and inferential exploration of associations, without reporting internal consistency estimates or claims of construct validity. Survey data were exported from Google Forms and analysed using IBM SPSS Statistics (version 27).

Inferential tests were used to analyse quantitative data, such as Fisher–Freeman–Halton exact tests; where exact computation was not possible, Monte Carlo estimation was applied (10,000 replications; 99% confidence interval). Cramer's V was used to quantify effect size. Statistical significance was set at $p < 0.05$. Where multiple testing occurred, Bonferroni adjustment and/or the Benjamini–Hochberg procedure were applied depending on the comparison set and analytic purpose.

Open-ended data were analysed using descriptive thematic coding. Where responses could be assigned to more than one theme, binary indicator variables (1 = theme present; 0 = theme absent) were created to summarise frequencies. Composite selections (e.g., "All of the above") were excluded from category counts to avoid inflating frequencies. When assumptions of mutual exclusivity were not met, results were presented descriptively without inferential testing. Overall, Phase 1 findings were interpreted as needs-assessment evidence guiding Phase 2 tool development.

3.2.2 Structured Development of the Electronic PNDP Tool (Phase 2: e-ΔΔΔΦ)

Phase 2 involved developing a Greek-language electronic tool that translates PNDP logic into a structured digital workflow suitable for the Cypriot practice setting. Development was guided by implementation priorities identified in Phase 1 and by PNDP framework requirements, aiming to maximise contextual relevance, maintain conceptual integrity, and support feasibility in routine clinical documentation.

The tool architecture followed the PNDP sequence (assessment, diagnosis, intervention, and monitoring/evaluation) so that information entry and outputs reflect a coherent reasoning pathway rather than fragmented data capture. PNDP constructs were adapted into Greek with emphasis on maintaining conceptual equivalence and professional clarity. The diagnostic component incorporated structured support consistent with PES reasoning to enhance transparency in nutrition diagnosis formulation. The tool was organised into modular components aligned with core assessment domains (anthropometric, biochemical, clinical, dietary), emphasising structured data entry to reduce unnecessary variation while retaining limited free-text fields where clinical context requires narrative elaboration.

Workflow and interface choices prioritised stepwise navigation and completion feasibility under time constraints, issues identified as central in Phase 1. Although the prototype was not integrated into the GHS electronic platform during this study, the design aimed to remain extensible, with consideration given to future interoperability, structured export, and potential use for audit and quality monitoring.

3.2.3 Expert Panel and Content Validation Procedures (Phase 3)

Phase 3 used a purposive voluntary panel of experts to evaluate the content adequacy and usability-related properties of e-ΔΔΔΦ. Purposive sampling was selected to ensure that reviewers had advanced clinical expertise and familiarity with structured documentation frameworks. Eligibility criteria required experts to be: a) registered dietitians or nutritionists with a minimum of five years of clinical experience, demonstrated familiarity with the PNDP framework and its diagnostic logic, or/and b) other experts involved in academic, leadership, or/and c) advanced professional roles within the field of nutrition and dietetics. Professionals fulfilling the eligibility criteria were contacted via email invitation. This ensured that appraisal reflected both practical implementation experience and broader professional judgement.

Experts reviewed the tool independently and provided structured ratings for each module across relevance, clarity, and simplicity using a 5-point Likert scale, alongside open-ended comments. Open-ended items were included to elicit narrative feedback on wording, module organisation, workflow fit, interface elements, and proposed improvements, allowing experts to identify refinements beyond those captured by fixed-response ratings.

Quantitative indices summarised agreement using the Content Validity Index (CVI) framework. For each module and domain, the item-level CVI (I-CVI) was calculated as the proportion of experts assigning high ratings (4–5). Scale-level CVI was summarised using the average method (S-CVI/Ave, mean of I-CVI values) and the universal agreement method (S-CVI/UA, proportion of items with complete agreement). Adequacy thresholds were interpreted in line with published recommendations for panels of this size (Polit & Beck, 2006; Polit et al., 2007).

Descriptive statistics (means, standard deviations, and frequency distributions) were also produced to describe rating patterns and identify modules with greater variability. Open-ended comments were summarised descriptively and grouped into thematic categories (e.g., wording, structure, interface, workflow) to guide revisions.

While agreement proportions can be derived in SPSS via binary recoding, CVI computations were completed in Excel so that formulas could be embedded directly in the dataset, supporting transparency, replicability, and auditability of each calculation step.

Quantitative CVI indices and qualitative expert comments were synthesised to interpret tool adequacy and determine refinement priorities. Quantitative results provided structured evidence of agreement across relevance, clarity, and simplicity, while qualitative feedback added contextual explanation and practical suggestions (e.g., adjustments to wording, readability, navigation cues, or additional fields). When numerical ratings and narrative feedback pointed to the same issue, changes were prioritised. When quantitative agreement was strong and suggestions were minor, refinements were applied selectively to improve usability while preserving the underlying PNDP workflow structure.

Overall, the phased design ensured continuity from needs identification (Phase 1), to prototype development (Phase 2), to expert-informed finalisation (Phase 3), resulting in a tool that is conceptually aligned, context-appropriate, and oriented toward practical clinical use.

3.3 Reporting on Results

The reporting of the two online questionnaires was guided by the Checklist for Reporting Results of Internet E-Surveys (CHERRIES), developed by Gunther Eysenbach (Eysenbach, 2004), as a methodological reporting framework intended specifically for online surveys (including email-distributed surveys). The CHERRIES checklist was introduced in the early 2000s, in response to the need for a dedicated checklist for internet-based survey research at a time when structured reporting guidance was largely available for other study types (e.g. clinical trials and systematic reviews), but not for e-surveys. In this study, CHERRIES was used to support transparent documentation of key features of online data collection that can influence interpretation, including the survey format (open/closed), recruitment and contact mode, informed consent and data-protection procedures, item presentation and navigation characteristics (e.g. number of pages, review/back options, and the use or non-use of randomisation and adaptive questioning), and platform-related constraints affecting the calculation of participation and completion metrics. Applying CHERRIES in this way strengthened methodological clarity by making the survey protocol and its implementation decisions explicit, enabling readers to better understand data collection progress and to critically appraise sources of bias and limitations that are specific to internet-based surveys (Table 3.0) (Eysenbach, 2004; Vassis et al., 2023).

Table 3.0: Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Checklist Item	**Explanation**	**Page Number (Phase 1 questionnaire)**	**Page Number (Phase 3 Questionnaire)**
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	93	99
IRB approval	Mention whether the study has been approved by an IRB.	104	104
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	104	104
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	104	104
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	94	100
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	94	99-100

Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	93	108
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	93	100
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	93-94	99-100
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	95	100
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	94	100

Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	94	100
Time/Date	In what timeframe were the data collected?	94	100
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	95	100
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	95	100
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	95	100
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	95	100
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if "yes", how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as "not applicable" or "rather not say", and selection of one response option should be enforced.	95	100

Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	95	100
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	N/A	N/A
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	N/A	N/A
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called "recruitment" rate.	95	100
Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate "informed consent" page or if the survey goes over several pages. This is a measure for attrition. Note that "completion" can involve leaving questionnaire items blank. This is not a measure for how	95	100

	completely questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)		
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	95	100
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	95	100
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	95	100
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example,	95	100

	was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?		
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	95	101
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	95	100
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	95	100

This checklist has been modified from Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). J Med Internet Res. 2004 Sep 29;6(3):e34 [erratum in J Med Internet Res. 2012; 14(1): e8.]. Article available at https://www.jmir.org/2004/3/e34/; erratum available https://www.jmir.org/2012/1/e8/. Copyright ©Gunther Eysenbach. Originally published in the Journal of Medical Internet Research, 29.9.2004 and 04.01.2012.

3.3.1 Modification of the Qualitative Data Collection Strategy

The initial research protocol included the use of a focus group to explore in greater depth dietitians' perceptions of PNDP implementation and digital documentation. Focus groups were originally proposed to facilitate interactive discussion, allowing participants to build upon each other's perspectives and generate collective insight through moderated dialogue.

However, as data collection progressed, it became evident that the structured questionnaire, particularly the inclusion of open-ended exploratory questions, generated rich qualitative data that directly addressed the exploratory objectives of the qualitative component. Responses provided detailed individual reflections on usability, workflow integration, professional visibility, and perceived barriers and facilitators to adoption. Preliminary analysis indicated thematic saturation across key constructs relevant to the research questions.

Given that the primary aim of the qualitative component was to capture professional perceptions rather than to examine group dynamics or consensus formation, the additional implementation of a focus group was determined to be methodologically unnecessary. Furthermore, logistical considerations, including scheduling constraints across geographically distributed practitioners and workload pressures within clinical settings, posed potential limitations to participation rates and diversity of representation.

It is acknowledged that focus groups rely on structured participant–researcher interaction and collective discussion to generate data that differ in nature from individual written responses. However, in this study, the qualitative objectives were sufficiently addressed through individual open-ended responses, which allowed participants to provide candid insights without potential peer influence or conformity pressures. This approach may have enhanced authenticity of responses, particularly in a small professional community where hierarchical or collegial relationships could influence open discussion.

The decision to exclude the focus group was therefore made to ensure methodological efficiency, reduce participant burden, and maintain alignment with the pragmatic research philosophy underpinning this study. The qualitative data obtained through the questionnaire were deemed adequate to complement quantitative findings and to address the exploratory research questions.

3.4 Detailed description of Phase 1

This study adopted a mixed-methods research design grounded in a pragmatic philosophical framework. The design combined quantitative and qualitative approaches to allow comprehensive examination of PNDP implementation within the Cypriot healthcare context.

By integrating measurable implementation patterns with experiential insights, the study aimed to capture both structural and perceptual dimensions of documentation practices.

The quantitative component employed a cross-sectional survey design to assess current documentation practices, usability perceptions, adoption patterns, and associations between documentation format (manual versus software-based) and key implementation indicators. Descriptive and correlational analyses were conducted to examine relationships between variables such as training exposure, electronic health record access, perceived time burden, and diagnostic confidence.

In addition, a second recruitment wave was conducted to increase participation and strengthen the Phase 1 needs-assessment dataset. While the overall study remained primarily cross-sectional in structure, the wider multi-phase design incorporated a later evaluative component for the electronic PNDP tool, introducing a sequential element to the overall methodological framework.

Quantitative data were analysed using Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarise demographic characteristics and implementation trends. Depending on distributional assumptions, parametric or non-parametric tests were applied to test for associations. Although correlational and regression analyses were considered, they were not conducted due to the limited sample size and the resulting constraints on statistical power and model robustness.

The qualitative component consisted of open-ended questions embedded within the questionnaire. These items were designed to capture participants' reflections on barriers, facilitators, workflow integration, and professional implications of structured documentation. Responses were analysed using thematic analysis. Coding was conducted systematically to identify recurring patterns and themes, which were subsequently integrated with quantitative findings to support methodological triangulation.

Although the original protocol (Table 3.2) included a focus group to deepen qualitative exploration, this component was deliberately excluded during the research process. As data collection progressed, it became evident that the open-ended questionnaire responses provided sufficient depth to address the exploratory aims of the study. Preliminary analysis demonstrated thematic saturation across key constructs related to usability, implementation barriers, and professional perceptions. Given that the primary qualitative objective was to capture individual experiences rather than examine interactive group dynamics, the additional implementation of a focus group was deemed methodologically unnecessary. This decision aligned with the pragmatic research philosophy underpinning the study and ensured proportionality between research aims and participant burden.

It is acknowledged that focus groups generate data through participant interaction and moderated discussion, which differ methodologically from individual written responses. However, the open-ended format allowed respondents to provide candid insights without peer influence, which may be particularly relevant within a small professional community.

The integration of quantitative and qualitative findings occurred at the interpretation stage. This convergent mixed-methods approach enabled comparison of statistical trends with thematic insights, strengthening internal validity and enhancing explanatory depth. To ensure methodological coherence and transparency, Table 3.1 presents the alignment between the overarching research aim, specific objectives, study phases, methodological approaches, and corresponding outcomes. This structured mapping illustrates how each phase of the research design directly addressed the stated objectives and contributed to the overall aim of the study.

Table 3.1: Alignment Between Research Aim, Objectives, Methods, and Outcomes.

Research Component	Objective	Study Phase	Methodological Approach	Key Outcome
Assess current documentation practices	Evaluate existing nutrition assessment and documentation methods in Cyprus	Phase 1	Exploratory cross-sectional national survey (n = 63); descriptive and exact statistical analyses	Identification of variability in PNDP implementation and documentation gaps
Examine quality and consistency of care	Determine whether current practices support structured, high-quality care	Phase 1	Survey analysis; thematic coding of open-ended responses	Evidence of discontinuation, diagnosis challenges, and time-related barriers
Explore awareness and perceptions of PNDP	Investigate familiarity, attitudes, and perceived barriers	Phase 1	Quantitative frequencies; non-parametric	High awareness but inconsistent sustained implementation

	to standardised language		associations; thematic analysis	
Identify structural and digital barriers	Assess workflow, training, and infrastructure constraints	Phase 1	Descriptive and qualitative analysis	Time burden and diagnostic reasoning difficulties identified
Develop electronic PNDP tool	Translate needs assessment findings into structured digital prototype	Phase 2	User-informed structured design; Greek linguistic adaptation; PES scaffolding integration	Development of e-ΔΔΔΦ aligned with PNDP logic and workflow
Validate tool content and usability	Evaluate relevance, clarity, simplicity, and feasibility	Phase 3	Expert panel (n = 7); I-CVI, S-CVI/Ave, S-CVI/UA; usability mean ± SD; qualitative feedback integration	Strong content validity (S-CVI/Ave = 0.92); high usability ratings

A visual representation of the electronic tool sequential stages of development, is presented in Figure 3.1.

3.4.1 Participants and Recruitment

The targeted population was dietetic professionals (nutritionists, dietitians, clinical dietitians with their specialties). Students undertaking their clinical placement were also included within the targeted population (postgraduate or doctoral level).

Participants were required to be fluent in Greek and English and work either privately or within a healthcare facility. Participants were also required to have access to a computer or an internet-enabled device and be able to read and respond to the questionnaire in Greek or English. Dietetic professionals who did not speak Greek or English or did not have access to a computer would be excluded from the study.

The study had a convenience sample recruitment approach. A call for participants was conducted via the Cyprus Nutrition and Dietetic Association (CyDNA) and social media platforms. The survey link was made publicly available via a scannable QR code and disseminated through online platforms such as Facebook and Instagram, using both the CyDNA and the researchers' accounts. Participants were able to self-select (voluntary participation) into the study after providing informed consent and confirming that they fulfil the eligibility criteria. Participation was anonymous, but participants had the option to provide their contact details to be informed about future phases of the study.

3.4.2 Sample Size Justification

According to current demographic data from the Cyprus Dietetic and Nutrition Association (CyDNA), the professional workforce includes 321 clinical dietitians, 271 dietitians, 11 sports dietitians, 40 nutritionists, and 107 students, with average ages ranging from 27 years (students) to 37 years (dietitians). Within the GHS, 322 registered dietitians are distributed geographically across districts, with the highest concentration in Nicosia (146), followed by Limassol (87), Larnaca (48), Paphos (31), and Famagusta (16). This distribution indicates both central clustering and nationwide professional presence within the public healthcare system. The Cyprus Dietetic and Nutrition Association formally supports this research (Appendix VI), reinforcing its relevance to national professional development.

The planned sample size was estimated at n = 218 based on 5% margin of error and 95% confidence level, and an estimated population size of 500 NDPs in Cyprus. A higher recruitment target of n=312 was set to account for anticipated 30% non-response and incomplete surveys.

3.4.3 Data Collection Instruments

Participants were asked to complete the Phase 1, online questionnaire (Appendix III), which was made available in Google Forms, between 28/11/2022–30/05/2023 and 10/3/2025–10/05/2025. Although the questionnaire had an open survey design, responses could not be submitted beyond these dates. The Phase 1 questionnaire was developed by the research team using Google Forms to examine PNDP-related awareness, knowledge, and implementation behaviours among nutrition and dietetic professionals in Cyprus. It was designed as a framework-guided exploratory instrument (needs assessment) rather than a psychometric scale intended for construct measurement or formal validation.

Questionnaire content was structured around established professional frameworks. The NCP provided the primary organising logic through its four stages (Assessment, Diagnosis, Intervention, Monitoring and Evaluation) and principles of structured diagnostic reasoning (Swan et al., 2017; The Academy Quality Management Committee and Scope of Practice Subcommittee of the Quality, Management Committee, 2013). Additional guidance was drawn from the PNDP framework issued by the BDA, which operationalises NCP logic and EFAD principles on harmonised documentation informed the broader framing (BDA, 2021; Yuill, 2012). Evidence from implementation studies describing facilitators and barriers to structured documentation was also used to shape items related to feasibility and sustained uptake (O'Sullivan, 2013). The questionnaire also collected demographic information. Other key explorations included advantages and disadvantages in the use of systematic language and the nutrition assessment tool (PNDP), in the form of open-ended questions.

Additionally, the questionnaire included variable types that, for SPSS purposes, were primarily coded as numeric and string variables. Most closed-ended items were entered as numeric categorical variables, with measurement levels mainly nominal and ordinal. Nominal variables were used for unordered categories such as yes/no responses, awareness, use/non-use, setting-related categories, and other categorical selections without inherent ranking. Ordinal variables were used for ordered response categories, such as grouped age, duration of practice, and self-rated knowledge or similar ranked responses. Items allowing respondents to select more than one option were handled in SPSS as sets of separate numeric dichotomous variables indicating the presence or absence of each response option. In contrast, open-ended responses were treated as string variables, as they contained free-text answers rather than predefined coded categories. Only a very limited number of questionnaire items were suitable for treatment as scale-level numeric variables, as most responses were collected in categorical rather than continuous form.

Adaptive questioning or randomisation of questionnaire items were not implemented. All participants were presented the same set of questionnaire items. Questions provided a dedicated field for alternative or non-response. For questions with prespecified response options and an additional “Other” option, participants were able to provide an alternative answer. Participants were able to review their answer via a “back” button. The number of items per page was limited to 3, with a total of 22 pages.

The data were initially collected through the Google Forms spreadsheet output and were then manually converted into a format suitable for quantitative and qualitative analysis using SPSS (version 27) or Excel, where appropriate. Only submitted responses were analysed.

Google Forms did not provide metrics on unique survey visitors or on individuals who accessed the information or consent page without submitting a response. Consequently, recruitment and participation rates could not be calculated, and the analytic dataset was limited to fully submitted questionnaires. For the same reason, a completion (attrition) rate could not be estimated, as the platform recorded only final submissions and does not capture partial responses or non-responders. No cookies, IP restrictions, or external analytics were implemented to estimate visitor counts, identify unique users, or prevent duplicate entries. Accordingly, analyses were restricted to completed submissions. In addition, the platform did not record survey completion time or time spent on individual items, and no minimum or maximum completion-time thresholds were applied.

To examine relationships between categorical variables, Fisher's Exact test was applied. For larger contingency tables, where exact computation is not feasible, p-values were estimated using the Monte Carlo method with 10,000 samples and a 99% confidence interval. Symmetric measures such as Cramer's V were assessed for the strength of association (estimates of effect size) and were taken into consideration for interpretation.

Inferential tests were used for interpretation of the results with a significance level set at $p<0.05$. For crosstabulations, the Chi-square test of independence was considered where assumptions were met; however, when expected cell counts were too small, significance levels were reported using the two-sided Fisher–Freeman–Halton Exact test.

To account for multiple comparisons where applicable, adjusted p values were used to avoid inflation of Type I error. The Bonferroni correction factor was implemented automatically by SPSS upon selection of the appropriate field. Alternatively, manual adjustment of p values using the Benjamini–Hochberg correction formula in Excel was performed. A monotonic correction was subsequently applied to ensure consistency in the ranking of statistical significance across multiple comparisons.

For open-ended questions where answers were collected and analysed for the appearance of new themes and multiple themes could be assigned per participant, multiple-response frequencies and crosstabulations were performed for observational and descriptive reasons, without inferential tests. Inferential tests assume mutual exclusivity of response per participant, and this assumption is violated in multiple-response crosstabulations. Questions allowed "Other" responses which were reviewed by the research team and categorised to their nearest meaning or retained as independent categories where appropriate.

For questions in which participants could select multiple options, corresponding binary-format variables were created, with a value of 1 indicating "selected" and 0 indicating "not selected". To avoid duplication and inflation of frequencies, individual variables that cover more than one theme upon selection, such as "All of the above", were excluded from individual counts using an appropriate filter within SPSS.

No statistical adjustments such as weighting of items or propensity score methods were used to account for potential non-representativeness of the sample. Errors identified during preparation of raw data for statistical analysis corrected based on the most reasonable interpretation of the original response. The corrected dataset and coding decisions were reviewed by the main supervisor.

3.5 Detailed Description of Phase 2 and Phase 3: Development and Validation of the Online Greek PNDP Tool (e-ΔΔΔΦ)

3.5.1 Conceptual Framework and Rationale

The development of the online Greek PNDP tool was grounded in the structural logic of the Process for Nutrition and Dietetic Practice (PNDP), which itself derives from the NCP. The tool was designed to operationalise the four core stages of the PNDP: assessment, diagnosis, intervention, and monitoring/evaluation, within a structured digital interface in the Greek language.

The primary objective of the tool was to enhance clarity, consistency, and professional communication among nutrition and dietetic professionals practising in Cyprus, particularly within a healthcare environment where structured electronic documentation templates were not previously available. The design sought to preserve fidelity to international PNDP standards while ensuring contextual alignment with national regulatory requirements and the GHS. It was developed by the researcher, who is also a clinical dietitian affiliated with GHS and does not have formal computer science training. Selected artificial intelligence tools, specifically ChatGPT, were used to support iterative drafting, prototyping, and refinement of the digital workflow under the researcher's direct oversight.

3.5.2 Development Process

The electronic PNDP tool was developed through a staged, iterative build process that translated the paper-based logic of PNDP into a structured, usable digital workflow. The development approach prioritised making clinical reasoning visible through sequential prompts, structured fields, and standardised terminology, rather than relying on narrative documentation alone. The design choices were also informed by implementation evidence indicating that electronic formats, particularly those incorporating structured menus and preformatted diagnostic options can improve clarity, usability, and practitioner confidence compared with manual documentation (Lovestam, Vivanti et al., 2019; Lövestam, E. et al., 2020; O'Sullivan, 2013)

Phase 1: Content structuring focused on converting PNDP into a Greek digital logic model. The framework was translated and restructured to preserve (i) conceptual equivalence with original PNDP constructs, (ii) clarity and professional relevance in the Greek language, and (iii) compatibility with local documentation practices. Translation was treated as a functional design task rather than a linguistic exercise: Greek labels, categories, and prompts were iteratively revised to align with how Cypriot practitioners document in routine care, while taking into consideration current GHS reporting requirements which align with the original PNDP decision pathway. This approach reflects the broader implementation literature, where adoption depends not only on endorsement and training, but also on whether documentation systems are practically compatible with real-world workflows and digital infrastructure (Lovestam et al., 2017; Vinci et al., 2023).

A particular emphasis was placed on structuring the nutrition diagnosis component using the Problem–Aetiology–Signs/Symptoms (PAS) format. Diagnostic fields were designed to guide users through sequential reasoning. From identifying the nutrition problem, to specifying aetiology, to selecting evidence, rather than enabling free-text entry as the default, which is currently the case when having to create a clinical note through GHS's electronic health system. This design choice mirrors international findings showing that PAS writing is commonly perceived as challenging in manual formats, but becomes more feasible when supported by structured templates, drop-down options, and preformulated statements embedded into the documentation system (Lovestam et al., 2017; O'Sullivan, 2013).

From a technical and structural perspective, the content was operationalised in a spreadsheet-based prototype supported by scripting logic (Google Apps Script), which enabled modular development and rapid iteration. Content blocks (e.g. Anthropometry, Medical History, Medication, Nutrition and Dietetic Diagnosis) were treated as configurable "tables" defined through a structured configuration layer using appropriate coding language (e.g. table-level metadata, titles, and rules for copying/clearing), allowing the PNDP pathway to be represented consistently across sections while remaining adaptable. A final "Summary of Assessment" sheet was used to consolidate outputs into a report-style view, reflecting the objective of producing coherent, auditable documentation. Automation routines were added to maintain readability and layout integrity (e.g. closing large gaps between copied sections), reinforcing the principle that usability is not an aesthetic add-on but a determinant of feasibility in high-volume clinical workflows (Lövestam, E. et al., 2020; Vivanti et al., 2018).

Phase 2: Interface design translated the structured PNDP content into a user-facing interface intended to support routine clinical documentation with minimal disruption to workflow. The tool was developed as an online platform with stepwise navigation across PNDP stages, enabling users to progress through assessment, diagnosis, intervention, and monitoring in a logical sequence while still reflecting the iterative nature of the PNDP cycle (i.e. the ability to revisit earlier stages when new information emerges). To reduce cognitive load and minimise free-text dependency, the interface incorporated structured input fields, dedicated assessment sections (anthropometric, biochemical, clinical, and dietary), and drop-down menus for common nutrition problems and standardised terms. These features functioned both as efficiency supports and as cognitive prompts to encourage consistent documentation and reasoning, consistent with evidence that structured electronic menus and guided templates can improve usability and acceptability of standardised frameworks in practice (Lovestam et al., 2017; O'Sullivan, 2013).

Within the diagnosis stage, guided PAS statement construction was embedded to support the formulation of Problem, Aetiology, and Signs/Symptoms components. Rather than relying on unstructured narrative entry, the tool supported sequential completion of the diagnostic logic through linked fields and selectable phrasing, strengthening traceability between assessment evidence and diagnostic conclusions. The PAS statement options used within the guided diagnosis workflow were grounded on the reference booklet titled "Nutrition Diagnosis: A Critical Step in the Nutrition Care Process", published by the American Dietetic Association (2006), ensuring that the phrasing and structure of diagnostic components aligned with established guidance for standardised nutrition diagnosis formulation. Monitoring and evaluation tracking fields were also incorporated to facilitate documentation of outcome indicators and follow-up notes in a way that remained visibly connected to earlier PNDP stages. Overall, the interface design was governed by simplicity, logical sequencing, reduction of cognitive burden, and workflow compatibility. Those are factors repeatedly identified as central to feasibility and adoption of structured documentation systems (Lövestam, E. et al., 2020; Vivanti et al., 2018).

Phase 3: Contextual alignment ensured that the prototype remained relevant to the Cypriot healthcare system and consistent with local documentation expectations. Terminology was reviewed for alignment with national professional standards and for acceptability within local clinical language, recognising that adoption is influenced by contextual fit as much as by conceptual validity (Lövestam, E. et al., 2020; Vinci et al., 2023). Assessment components were refined to reflect commonly used clinical measures within the General Health System (GHS/ΓΕΣΥ), with data fields structured to support systematic recording and future retrieval. Although the tool was not embedded within the GHS platform, its data architecture and terminology were designed to facilitate potential future integration into electronic health records by privileging structured fields and consistent vocabulary over idiosyncratic free-text entry. Therefore, the Medical History content block was structured using ICD-10 coding conventions, aligning the tool's diagnostic classification format with that routinely used by physicians and allied health professionals within the GHS (OAY, 2020). The prototype was therefore developed as a standalone digital system suitable for pilot evaluation and iterative refinement, while maintaining forward compatibility with broader digital documentation environments. This approach remains consistent with findings that implementation is strengthened when systems can accommodate structured templates and standardised terminology in routine practice (Lovestam et al., 2017; O'Sullivan, 2013).

Overall, this staged development process established (i) a conceptually faithful Greek PNDP logic model, (ii) a usability-oriented interface that scaffolded clinical reasoning and documentation, and (iii) contextual alignment with Cypriot practice realities and digital infrastructure considerations. By shifting complexity away from the user and into the design of the digital workflow, the tool directly addressed commonly reported implementation barriers, especially time burden, training demands, and template incompatibility, while preserving the core PNDP objective of structured, auditable clinical reasoning (O'Sullivan, 2013).

3.5.3 Participants and Recruitment – Selection of Experts (Methodology)

Expert validation was conducted using a purposive sampling strategy to recruit a panel with relevant expertise for evaluating the content and structure of the electronic PNDP tool, through an online questionnaire, with embedded training components. Eligibility criteria required experts to be: a) registered dietitians or nutritionists with a minimum of five years of clinical experience, demonstrated familiarity with the PNDP framework and its diagnostic logic, or/and b) other experts involved in academic, leadership, or/and c) advanced professional roles within the field of nutrition and dietetics. Including individuals holding academic appointments, supervisory responsibilities, or leadership roles, ensured representation of both practice-based and governance-related perspectives. All experts were approached via direct invitation (email) and were asked for their voluntary participation to evaluate the tool. Evaluation was done independently by each expert to minimise peer influence and support unbiased appraisal.

3.5.4 Sample Size Justification

In regard to the sample size, more recent methodological guidance and applied content-validity studies commonly use expert panels of about 5–10 members, as this range is usually large enough to capture different perspectives while still being feasible to recruit. Therefore, 10 experts were set as a practical target (Polit & Beck, 2006; Polit et al., 2007; ROEBIANTO et al., 2023).

3.5.5 Data collection Instruments and Validation Procedure

Similarly to Phase 1 Questionnaire, the Expert validation of the electronic PNDP tool was conducted via an online survey administered using Google Forms. The validation survey was disseminated through direct invitation to purposively recruited experts and remained open for submissions between 04/01/2026 and 29/01/2026. Participation was voluntary and conditional upon completion of an electronic informed consent item presented at the beginning of the survey. The experts were given the option to provide their contact details if they wished to be acknowledged for their contribution to the validation of the tool. To minimise respondent burden and support completion, the questionnaire was delivered in a structured, page-based format with a limited number of items per screen and included a review function that allowed participants to navigate back to previous pages before submission. All experts evaluated the tool independently to reduce potential peer influence. Given the purposive recruitment approach and the evaluative purpose of this component, the survey was not designed to estimate view, participation, or attrition rates; additionally, consistent with Google Forms platform constraints, unique visitor counts and view metrics were not available for calculation of recruitment or completion rates.

No statistical adjustments such as weighting of items or propensity score methods were used to account for potential non-representativeness of the sample. Error identified during preparation of raw data for statistical analysis was handled as what was assumed more reasonable. Review of the corrected method was assessed by the main supervisor.

The validation instrument combined structured quantitative ratings with open-ended qualitative prompts to support iterative refinement of the prototype. Using 5-point Likert-type items, experts assessed key domains relevant to content validity and usability, including content relevance, terminology clarity, navigational simplicity, logical sequencing, and overall usability. To minimise systematic response bias and maintain comparability across respondents, item randomisation and adaptive questioning were not implemented; all participants received the same set of evaluation items. Open-ended questions complemented the fixed-response ratings by inviting written feedback on suggested modifications, missing or underrepresented components, practical feasibility in routine practice, and broader implementation considerations (e.g. workflow fit and integration constraints). This mixed-format approach enabled triangulation of quantitative appraisal with narrative insight, allowing strengths and limitations to be evaluated both systematically and in context, and ensuring that revisions were guided by domain-specific professional judgement. However, the questionnaire has not been assessed for its use of technicality before dissemination, posing a possible limitation to the study.

3.5.6 Quantitative Validation Analysis

Content validity of the electronic PNDP tool (e-ΔΔΔΦ) was evaluated using quantitative indices in accordance with established methodological recommendations for instrument validation. For each item, the Item-Level Content Validity Index (I-CVI) was calculated as the proportion of experts assigning a rating of 4 or 5 on the 5-point Likert scale, indicating high agreement regarding relevance, clarity, or simplicity. For panels comprising six or more experts, an I-CVI threshold of ≥ 0.78 was considered acceptable (Polit & Beck, 2006; Polit et al., 2007).

Scale-level validity was assessed using two complementary indices. The Scale-Level Content Validity Index based on the average method (S-CVI/Ave) was calculated as the mean of the I-CVI values across all items, while the Scale-Level Content Validity Index based on universal agreement (S-CVI/UA) represented the proportion of items achieving complete agreement among experts. An S-CVI/Ave value of ≥ 0.90 was interpreted as reflecting strong overall content validity.

In addition to content validity indices, descriptive statistics were computed to provide further insight into expert evaluations. For each module and evaluation dimension (relevance, clarity, simplicity), means, standard deviations, and frequency distributions were calculated. Reporting both central tendency and dispersion allowed assessment of rating consistency and identification of items with greater variability, even when CVI thresholds were met.

All statistical analyses on submitted responses were performed using IBM SPSS Statistics (version 27) and Microsoft Excel.

3.5.7 Qualitative Feedback Analysis

Qualitative feedback was collected via open-ended items embedded within the same online validation questionnaire. Consistent with CHERRIES guidance on survey design transparency, these open-ended prompts were provided to all participants (i.e. no conditional display), allowing experts to elaborate on proposed modifications, identify missing components, and comment on practical feasibility and implementation considerations. Open-ended responses were analysed using thematic analysis, following an inductive coding approach in which comments were first reviewed in full, then coded into meaningful units, and subsequently grouped into higher-order categories reflecting the focus of recommendations. For reporting and tool refinement purposes, feedback was organised into categories including structural improvements, terminology refinement, interface usability, and integration recommendations, with final themes refined through iterative review to ensure internal coherence. Findings from the qualitative analysis were used formatively: revisions to the prototype were implemented where patterns of feedback were recurrent across experts, supporting iterative optimisation of the tool.

All statistical analyses were performed using IBM SPSS Statistics (version 27) and Microsoft Excel.

3.5.8 Usability Evaluation

Usability was assessed using a combination of Likert-scale ratings and open-ended reflections embedded within the validation questionnaire. Specifically, experts evaluated key usability domains relevant to clinical feasibility, including perceived ease of use, workflow compatibility, time efficiency, diagnostic confidence, and the perceived impact on professional communication. The inclusion of open-ended prompts enabled experts to contextualise their ratings by describing usability barriers, interface preferences, and practical considerations for implementation.

3.5.9 Methodological Positioning

The development of the online PNDP tool (e-ΔΔΔΦ) was methodologically positioned within a pragmatic mixed-method framework, reflecting the applied aim of producing a solution that is not only conceptually sound but also usable and implementable in routine practice. Pragmatism was appropriate because the primary emphasis was placed on *what works* within the Cypriot context, rather than on adherence to a single epistemological tradition. In this study, the tool was treated as an implementation mechanism: a structured means of translating PNDP principles into day-to-day documentation behaviour, rather than as a purely technical product. This positioning aligned the development process with practice realities, including variable documentation habits, limited availability of structured electronic templates, and the need for a feasible workflow within time-pressured clinical environments.

In practical terms, this methodological stance meant that development decisions were guided by the dual requirement of conceptual fidelity and clinical feasibility. Conceptual fidelity was maintained by preserving the logic of PNDP (assessment, diagnosis, intervention, monitoring/evaluation) and embedding structured diagnostic reasoning through a guided PAS format, thereby making clinical reasoning more explicit and auditable than narrative-only documentation. At the same time, feasibility was addressed through design choices that reduced cognitive load and free-text dependency (e.g. structured fields, stepwise progression, and preformatted options), recognising that consistency in documentation is strongly influenced by interface design, workflow compatibility, and perceived time burden. From this perspective, standardisation was not framed as an abstract goal, but as an operational outcome of a system that prompts consistent thinking and recording across users and settings.

The mixed-method approach strengthened this positioning by ensuring that the tool was iteratively refined using both structured quantitative appraisal and contextual qualitative insight. Quantitative ratings provided a systematic indication of perceived adequacy across domains such as relevance, clarity, and usability, while open-ended feedback captured the reasoning behind ratings and highlighted practical barriers, preferred workflows, and missing clinical elements. This combination supported a formative, improvement-oriented validation logic: recurring concerns across experts were treated as implementation signals and were used to prioritise refinements that increased usability and contextual fit. Importantly, because the validation and usability evaluation were conducted through an online survey format, procedures were documented transparently in line with CHERRIES, ensuring clarity about survey design decisions (e.g. purposive administration via Google Forms, voluntary participation, consent procedures, uniform item presentation without adaptive questioning or randomisation, and platform-related constraints around view and completion metrics).

Finally, positioning the tool as an implementation mechanism foregrounded wider professional and system-level functions beyond data entry. By structuring the PNDP pathway into a coherent digital workflow and producing outputs that support clearer reporting, the tool was intended to enhance professional visibility (through clearer articulation of dietetic reasoning and contribution) and improve interdisciplinary communication (through structured terminology and more legible summaries). The emphasis on contextual adaptation, Greek language use, alignment with documentation expectations in Cyprus, and forward-compatible structuring for potential integration was therefore not an “add-on”, but a core methodological requirement for adoption in a small, digitally evolving healthcare system. Through this integrated approach, the development process aimed to bridge the common gap between theoretical endorsement of structured documentation and its practical operationalisation in everyday clinical work.

3.5.10 Summary

The online Greek PNDP tool (e-ΔΔΔΦ) was developed to operationalise the PNDP framework, derived from the NCP, within a structured digital interface that supports assessment, diagnosis, intervention, and monitoring/evaluation in Greek. The tool was designed to enhance documentation clarity, consistency, and professional communication among nutrition and dietetic professionals in Cyprus, while remaining aligned with local regulatory expectations and the GHS. Development followed a staged, iterative process that translated the paper-based PNDP pathway into a usable digital workflow. Key design priorities included making clinical reasoning visible through structured prompts and standardised terminology, supporting diagnosis formulation through guided PAS logic, reducing reliance on free-text entry, and generating coherent outputs through an automated “Summary of Assessment”. The prototype was built using a spreadsheet-based architecture supported by scripting, allowing modular configuration of content blocks and rapid refinement. Additionally, the e-ΔΔΔΦ prototype reflects a researcher-led, practice-informed development process undertaken by a GHS-affiliated clinical dietitian without specialist programming expertise, in which ChatGPT was used as an assistive resource during iteration while all methodological decisions, clinical content selection, and final implementation choices remained the responsibility of the research team.

Contextual adaptation was embedded throughout development to maximise feasibility within Cypriot practice realities. Terminology and assessment fields were refined to reflect local clinical documentation habits and GHS requirements, with forward-compatible structuring to support potential future electronic health record integration. Expert validation and usability appraisal were subsequently conducted using a CHERRIES-informed online questionnaire administered via Google Forms. The validation combined Likert-type quantitative ratings (analysed descriptively and, where applicable, using a Content Validity Index) with open-ended qualitative feedback analysed thematically. Usability domains (e.g. ease of use, workflow compatibility, time efficiency, diagnostic confidence, and perceived communication impact) were embedded within the same instrument to support integrated appraisal. Findings were used formatively, with revisions implemented where consistent themes emerged, ensuring that the final prototype reflected conceptual fidelity, contextual fit, and empirical feedback within a pragmatic mixed-method development approach.

3.6 Ethical Considerations

Some personal data were collected from both questionnaires. Specifically, demographic information including age, town of practice and voluntary provision of contact information were collected from the first questionnaire, that aimed to assess current knowledge and use of systematic languages and nutrition assessment tools. Participants were offered to be informed about the study results, and if so, they voluntarily provided their contact. All data were handled according to Regulation (EU) 2016/679 on the protection of personal data. The data were only kept and used for the purposes of the research and once the research had concluded and the data were no longer required, they were deleted. Only relevant and necessary data were collected. Data were stored on a password protected cloud server (Dropbox, Google Drive) accessible only to the research team through individual password-protected accounts. All devices used to access the server were also secured with password protection.

The study methodology was approved by the University's research ethics committee before the deployment of the questionnaire. Approval was received from the University of Nicosia Ethics Committee (UREC/2021/15, Appendix V), after careful review of the research protocol (Table 3.2). To proceed with the questionnaire, participants were required to provide their informed consent. Consent was recorded through a mandatory item at the beginning of the survey. The completion of the questionnaire was anonymous, unless the participant deliberately provided their email address to be informed about subsequent phases of the research, with the intention to participate. The questionnaire was published with a cover letter that described the study's aims and objectives and outlined the data handling protocol. The cover letter also included details about the researchers and their institution, as well as contact information for an independent university representative who could be approached with questions or complaints. This contact person was a member of the university but not involved in the research.

Likewise, the questionnaire that aimed to assess the validation of the electronic tool collected the email address of those who deliberately provided it through an appropriate section within the questionnaire, with the intention of acknowledging their contribution to the validation of the tool. The questionnaire was published with a cover letter explaining the aims and objectives of the research and included the contact details of the designated university representative for questions or complaints. The correspondence or complaints contact was a member of the university that was not related to the research.

3.7 Limitations

This study employed an open online survey distributed through social media platforms and professional networks, using a convenience sampling approach. While this strategy enabled broad and rapid dissemination across geographically dispersed practitioners, it may have limited participation among eligible nutrition and dietetic professionals (NDPs) who do not actively engage with social media or digital communication channels. Consequently, unequal access to recruitment channels may have reduced inclusivity and introduced coverage bias.

Self-selection into the sample represents an additional limitation. Participation was voluntary and based on self-report, with no external verification of eligibility beyond participants' declarations. Individuals with a particular interest in structured documentation, digital tools, or professional development may have been more inclined to respond, potentially inflating estimates of awareness, confidence, or perceived value. The absence of weighting procedures or propensity score adjustments means that analyses were conducted using unadjusted data, limiting representativeness of the achieved sample.

The achieved sample size was modest relative to the total number of registered NDPs in Cyprus, which further constrains statistical power and generalisability. As a result, findings should be interpreted as indicative of trends within the responding cohort rather than definitive estimates of national practice patterns.

Data collection occurred in two phases separated by a substantial temporal gap of approximately one year due to unavoidable personal circumstances. This interruption introduces potential temporal effects, including changes in professional training exposure, system-level developments within the General Health System (GHS), or evolving familiarity with structured documentation frameworks. Although duplicate entries were screened, the possibility of contextual variation between phases cannot be entirely excluded. This may have reduced comparability across participants responding at different time points.

Platform-related constraints also influenced data completeness. Google Forms does not record the number of individuals who accessed the survey link, viewed the consent page, or partially completed the questionnaire. Therefore, response rate, participation rate, and attrition patterns could not be calculated. The analysis was restricted to fully completed submissions, limiting insight into drop-out behaviour and potential non-response bias.

The qualitative component relied on open-ended survey responses rather than interactive methods such as focus groups. Although responses provided meaningful individual insights, this format does not allow examination of group dynamics, consensus formation, or interactive debate. However, it may have reduced peer influence effects and encouraged candid responses within a relatively small professional community.

The questionnaire was primarily oriented toward clinical practice settings and did not fully capture experiences of NDPs working exclusively in public health nutrition or group consultation contexts. Given that PNDP and structured documentation frameworks are applicable across broader domains of dietetic practice (BDA, 2021), this may limit the scope of interpretation. Additionally, a separate demographic category distinguishing students undertaking clinical placement from qualified practitioners would have allowed clearer subgroup comparisons regarding knowledge, confidence, and structured language use.

Finally, as with all self-reported research, responses may be subject to recall bias, social desirability bias, and subjective interpretation. While the mixed-method design strengthens internal validity through triangulation of quantitative and qualitative data, findings should be interpreted within the context of these methodological constraints. An additional limitation relates to the development of the e-ΔΔΔΦ. Because the tool was developed by a researcher who is not a computer expert, the platform's interface design, functional scope, and technical sophistication were constrained by the developer's non-specialist programming skills, which may have limited the extent to which usability, automation, and scalability features could be optimised.

3.8 Reflexivity of the Researcher

The lead researcher is a registered clinical dietitian with professional experience in structured documentation and clinical nutrition practice. This disciplinary background provided valuable contextual understanding of the PNDP framework, terminology use, and workflow realities within dietetic settings. Such domain expertise facilitated informed questionnaire design, interpretation of clinical terminology, and contextual sensitivity during tool development.

However, professional proximity to the subject matter also carries potential risks of interpretive bias, including assumptions regarding the value of structured documentation or expectations related to digital implementation. To address this, reflexivity was maintained throughout the research process. The researcher engaged in continuous self-reflection regarding pre-existing assumptions, particularly when developing survey items and interpreting qualitative responses.

Supervisory oversight and methodological consultation were employed to enhance objectivity and reduce the influence of professional bias. Questionnaire design and electronic tool structure were reviewed by academic supervisors and, where applicable, by independent experts. Analytical decisions, including coding of qualitative responses and interpretation of findings, were discussed collaboratively to ensure transparency and reduce single-researcher influence.

Additionally, the use of structured quantitative instruments limited interpretive flexibility in statistical analysis, supporting analytical neutrality. The mixed-method approach further strengthened methodological rigour by allowing triangulation between quantitative and qualitative findings.

By explicitly acknowledging positionality and implementing supervisory checks and transparent procedures, the study sought to balance professional expertise with methodological objectivity. The researcher did not hold a managerial or evaluative role over participants, thereby reducing potential power imbalance or response coercion.

3.9 Conclusion

Overall, this chapter outlined the philosophical stance, methodological design, and analytic approach used to examine current knowledge, perceptions, and implementation trends of standardised documentation processes among nutrition and dietetic professionals in Cyprus. A pragmatic research philosophy supported a mixed-methods approach, combining a cross-sectional survey design with correlational analyses and expert validation of the electronic PNDP tool, while accounting for both measurable outcomes and subjective professional experiences. Recruitment through CyDNA and social media enabled inclusion of practitioners affiliated and not affiliated with GHS, reflecting the geographic and professional diversity of the Cypriot workforce. The chapter also detailed ethical and data-protection procedures, alongside a transparent quantitative and qualitative analysis plan using SPSS and appropriate correction methods for multiple comparisons. Finally, key methodological limitations such as convenience sampling, self-reported data, and limited representation of some practice areas were acknowledged to contextualise interpretation of findings and support the transition to the presentation of results in the subsequent chapter.

Table 3.2: Research Protocol submitted to UREC

Research Protocol

1.0. Research Title

Development of an electronic tool to improve the quality of dietetic practice and support clinical reasoning.

2.0. Research Summary

The study is observational, descriptive with correlations and starts as a cross-sectional study that develops into a cohort study. It includes a focus group therefore incorporates both quantitative and qualitative features. It is conducted by a PhD student and the supervisor of the project from the University of Nicosia. Participants of the study will be dietetic professionals (nutritionist, dietitians, clinical dietitians). The first part of the research will include the completion of an introductory questionnaire to establish current knowledge around a systematic language used within health care professionals. Based on that data, the researchers will proceed on informing and educating dietetic professionals on the use of the Process for Nutrition and Dietetic Practice tool (PNDP), which is part of the Nutrition Care Process tool (NCP). When participants are more confident to the use of PNDP, they will be asked to complete a questionnaire to help identify any strengths and limitations considering the use of PNDP. The research team will form an electronic tool, that will use the PNDP as a structure, while taking into consideration the strengths and limitations arising from the questionnaire, in order to create an easy to use and effective nutrition assessment electronic tool that incorporates a systematic language for dietetic professionals and other health professionals.

3.0. Research Description

3.1. Rationale

Patients with acute and/or chronic diseases should undergo thorough nutritional assessment by the dietitian. The Process for Nutrition and Dietetic Practice (PNDP), which is a part of the Nutrition Care Process (NCP) tool, is a professional nutritional assessment tool used by dietitians to incorporate their knowledge and ability for critical thinking into a structured document, to provide consistent quality medical nutrition therapy. Quality therapy is defined by effectiveness of health care services, patient satisfaction and safe medical nutrition service. It is also important for record keeping and reassessment for the suitability and efficacy of given nutritional treatment [1]. There are inconsistent data around the efficacy of currently used nutritional assessment methods and the effectiveness in their use by the dietitians, while the gold standard is yet to been discovered [2]. The NCP allows for the collection of data that is measurable and that can be evaluated and analyzed to extract meaningful information about the patient's progress, therefore enabling the dietitian to direct medical nutrition therapy accordingly [3,4]. A dietetic team in an acute health care center in Los Angeles adopted NCP in a period of 3 months. After that, dietitians managed to keep their nutrition records short, to increase their productivity by 30%, and to increase awareness of the importance of dietetic intervention by other health care professionals, initially by 15% and later by 75%.

A customized nutritional assessment software that adopts PNDP and shapes it into an easy to use, quick and safe tool, can further maximize effectiveness and quality of care provided by the dietitians. The suggested software is an innovative project that corresponds to the current needs of the newly developed general health system in Cyprus, and it is supported by the Cyprus Dietetic and Nutrition Association. This electronic programme will be targeted for dietitians, but it will have an additional part which it will enable the professional communication with other health professionals for the wellbeing of the patients. The programme will have the possibility to access the patient's medical history, laboratory values, pharmaceutical information according to the Regulation (EU) 2016/679 on the protection of personal data and upon patient's permission.

3.2. Aim of the study

i. The aim is to develop an electronic tool to educate dietetic health professionals to support the development of consultation skills and clinical reasoning.

ii. The primary goal is to integrate this tool into dietetic practice with the use of accepted documentation standards to support dietetic outcome collection as well as an agreed structure for paper and/or electronic dietetic records.

iii. The secondary goal is to assess and evaluate current methods of nutrition assessment and medical nutrition therapy that is prescribed.

iv. Tertiary and final goal is to suggest new ways of improving current practices and quality of dietetics in Cyprus via proposing the use of PNDP and via educating clinical dietitians to use appropriately the PNDP. PNDP is part of the Nutrition Care Process.

3.3. Objectives

i. To investigate current methods of nutrition assessment and practices of medical nutrition therapy and assess if are adequately performed to provide a high-quality patient centered nutrition service.

ii. To assess if there is a space for improvement in the current methods of nutrition assessment and practice of medical nutrition therapy.

iii. To assess if the PNDP use will improve current practices and quality of dietetics in Cyprus if needed to be improved.

iv. To develop an electronic tool to educate dietetic health professionals to support the development of consultation skills and clinical reasoning.

v. To educate dietetic professionals in the use of PNDP and the use of the newly developed electronic tool.

3.4. Research Hypothesis

I. Current methods of nutrition assessment and practices of medical nutrition therapy are adequately performed to provide a high-quality patient centered nutrition service.

II. There is no space for improvement in the current methods of nutrition assessment and practice of medical nutrition therapy.

III. The PNDP use will not improve current practices and quality of dietetics in Cyprus.

4.0. Methodology

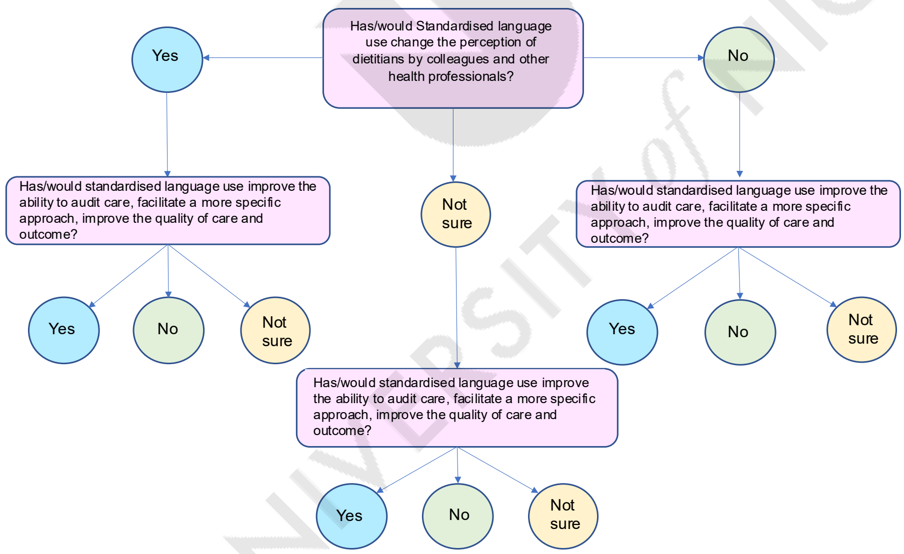
4.1. Study Design

The study is observational, descriptive with correlations and starts as a cross-sectional study that develops into a cohort study. It includes a focus group therefore incorporates both quantitative and qualitative features.

4.2. Study Stages

	Research Process	Research Writing
Stage A	Deciding on the subject and clarification of the study question (1 week)	Literature Review and Identification of innovation based on the gap in literature (1 month)
Stage B	Writing of the Research Protocol and Validation of the questionnaire using SPSS 27 and expert team (1 month)	Writing of the Methodology (1 week)
Stage C	Data collection based on the questionnaire and statistical analysis (4 months)	Writing of the Results and Discussion of the Results (1-2 months)
Stage D		Completion of Research Writing and Journal Publication (3-4 months)

4.3. Question algorithm



4.4. Aim of the Questionnaire per question

Aim	Question	Statistical Test
Aim 1: Demographic Data		

	Aim 1a: To investigate whether there are differences in professional practice among dietetic professionals that work in a village, city, or a town	Q3	Kruskal-Wallis, K Independent Samples
	Aim 1b: To investigate if the dietetic professional works differently when in a multidisciplinary team, when in a health care faculty or as an independent health professional	Q5	Kruskal-Wallis, K Independent Samples Spearman & Kendall's tau-b correlation
	Aim 2: Documentation Process for Dietetic Care		
	Aim 2a: To understand correspondents' knowledge about the documentation process for dietetic care	Q6, Q9	Chi Square Test
	Aim 2b: To assess awareness for current recommendations for documenting the dietetic care in Cyprus	Q6	Chi Square Test
	Aim 2c: To understand current opinions about the documentation of dietetic Care	Q7, Q8	Chi Square Test
	Aim 3: Standardised Language		
	Aim 3a: To form an idea of dietetic professionals' understanding and knowledge about standardised language	Q10, Q11, Q25	Chi Square Test
	Aim 3b: To identify the preferred standardised language, based on the environment of practice	Q12, Q23	Mann-Whitney U, 2 Independent Samples

	Aim 3c: To investigate the perceived benefits and disadvantages of using a standardised language, and suggestions for improvement	Q13, Q14, Q26	Wilcoxon singed rank, one sample
	Aim 3d: To collect opinions about the preferred method of introducing a standardise language in clinical practice and academic setting	Q15, Q16	Wilcoxon singed rank, one sample
	Aim 3e: To understand the environment that dietetic professionals believe that a standardised language could be used	Q18	Mann-Whitney U, 2 Independent Samples
	Aim 3f: To be informed of the perceived comfortable time frame needed to introduce a standardise language to the dietetic professionals	Q17	Wilcoxon singed rank, one sample
	Aim 3g: To assess the agreement between correspondents and evidence from literature review, concerning expected changes following the adoption of a standardised language	Q19, Q20	Chi Square Test & Spearman – Kendall's Tau, correlations
	Aim 3h: To understand the gaps and current needs for the selection and adaptation of a standardised language	Q21	Wilcoxon singed rank, one sample
	Aim 3i: To assess the importance of standardised language in the academic environment	Q22, Q23	Wilcoxon singed rank, one sample

Aim 3j: To understand which standardised language should be taught for each environment according to the dietetic professionals	Q24	Chi Square Test & Wilcoxon singed rank, one sample
Aim 3k: To assess knowledge about nutrition diagnosis	Q27, Q28	Chi Square Test
Aim 3l: To assess current knowledge, thoughts about the PNDP as well as any difficulties in its use	Q29-Q32	Chi Square Test

4.5. Population and Inclusion/Exclusion Criteria

The targeted population are dietetic professionals. Participants should be fluent in Greek and English and work either privately or within a health care faculty. They must also have access to a computer and be able to use it. Dietetic professionals that do not speak Greek or English, or do not have access to a computer will be excluded from the study.

4.6. Interventions

Participants will be asked to complete in total up to 4 questionnaires to finalise the ideal format of the electronic tool. The first questionnaire will be adopted, with few amends, by the European Federation of the Associations of Dietitians (EFAD), translated, and re-written in Google Forms. The questionnaire will be sent to the participants via a URL link through the social media (e-mail, Instagram, Facebook) of the Cyprus Nutrition and Dietetics Association as well as through the personal accounts of the researchers. The questionnaire will aim to collect demographic information and data to assess current knowledge and use of systematic languages and nutrition assessment tools.

Later, the researchers will contact the dietetic professionals that have successfully completed the questionnaire and voluntarily provided their contact information and ask for their interest to participate to the second part of the research that is discussed later. In addition, invitations will be sent through the social media account (e-mail, Instagram, Facebook) of the Cyprus Nutrition and Dietetic Association (CyDNA) asking for the recruitment of dietetic professionals. Dietetic professionals can benefit from their participation to the study by learning new approaches to improve their clinical practice and provide a quality dietetic service. In addition, they can contribute to the reformation of a PNDP that suits their needs in practising a safer and better-quality service.

The remaining questionnaires will aim to identify any advantages and disadvantages in the use of systematic language and nutrition assessment tool (PNDP) and to assess efficacy and compatibility of the newly created electronic tool in order to finalise its form. The questionnaires will be based on previous studies investigating similar topics [5][6].

For the focus group, the participants (dietetic professionals) will be educated in the use of PNDP and the electronic tool. They will also have the possibility to access the medical history, laboratory values and pharmaceutical information for their clients through the electronic tool, according to the Regulation (EU) 2016/679 on the protection of personal data and upon patient's permission.

Access to the above information will be granted only to the participants, only for their clients, and only with their client consent. Research team will only have access to the client health records for the formation of the electronic tool and not for their processing, and only for the time needed to complete the research.

Therefore, Participants will be asked to dedicate some of their time to complete a questionnaire. Participants will not be put in any health risks or hazard. In addition, for the subjects to participate in the study, they must sign the consent form.

4.7. Observations

The researchers will identify key points of focus and improvement that will be discussed during education of the dietitians. Key points to focus and parameters to be assessed will depend on the data extracted from the questionnaire and are expected to be time efficacy, the level of difficulty, accessibility to a nutrition assessment tool, language barriers, applicability, validity, and process of work.

Demographic information that will be collected include sex, age, town they practice their profession, questions to determine knowledge around the programme.

4.8. Sample size

According to an online sample calculator, with an estimated population of 500 dietetic professionals in Cyprus, the study would need at least 218 subjects to satisfy for a confidence interval of 5% and a confidence level of 95%.

5.0. Ethics and Bioethics

Some personal data will be collected from both the questionnaires and the focus group, such as age, gender, town of practice and contact information. In addition, the focus group as well as the researchers will have the possibility to access the patients' medical history, laboratory values and pharmaceutical information, only if the patients have given his/her permission, by signing the consent form provided to him/her. All data will be handled according to the Regulation (EU) 2016/679 on the protection of personal data. Patients will be transparent to what happens to their personal data. The data will only be kept and used for the purposes of the research and once the research has ended and the data are not needed anymore, they will be deleted. Only relevant and necessary data will be collected. Data will be handled in such way that the risks that could compromise the patients' confidentiality and integrity are minimised.

6.0. Contacts for complaints

The participants can find on the consentform the contact information for the representative personnel to whom they can file a complaint about the research.

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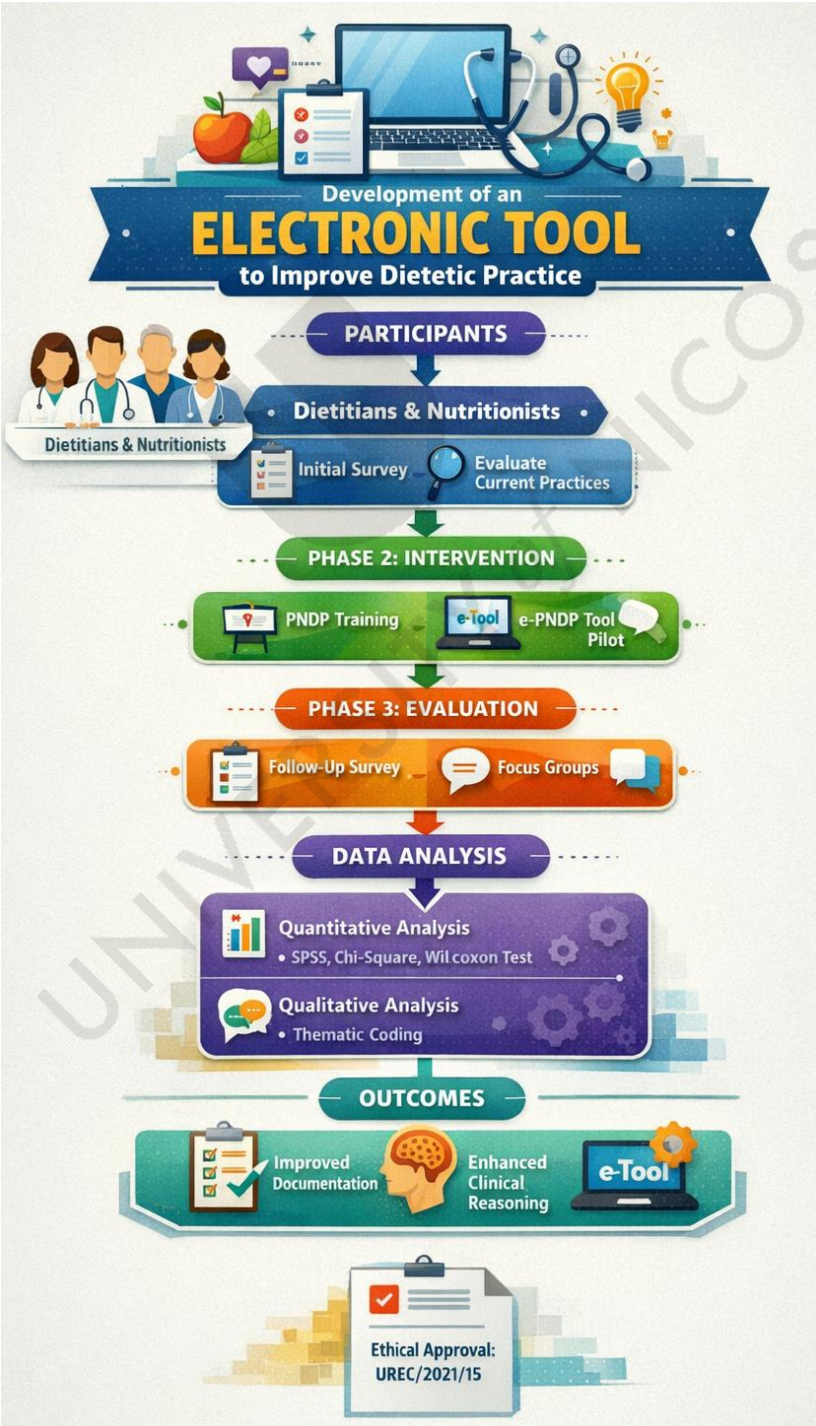
Figure 3.1: Visual representation of research design for electronic tool



CHAPTER 4 RESULTS

4.0 Introduction

This chapter presents the empirical findings of the study, with limited analytic description where necessary to clarify statistical and validation results. Detailed discussion and broader contextual interpretation are presented in Chapter 5. Results from Phase 1 (Phase 1 questionnaire) were used to describe current knowledge, implementation patterns, and perceptions of standardised documentation processes (DPs), including PNDP and structured language use, among nutrition and dietetic professionals (NDPs) in Cyprus. Quantitative findings were reported using descriptive statistics and, where appropriate, inferential tests of association. Responses to open-ended questions were analysed thematically and presented as categorical findings with supporting frequencies to illustrate prevalence of views.

The validation questionnaire responses from Phase 3 were collected in Google Forms and exported via the automatically generated response spreadsheet for data handling and analysis. The dataset was checked for completeness and internal consistency, and analysis was restricted to fully submitted questionnaires. No demographic variables (e.g. age or location) were collected for this validation component, and results were analysed and reported only in aggregate form. Where participants opted to provide identifying details (i.e., consent to be named), these details were used exclusively to prepare the acknowledgements section and were not used in any stage of analysis or reporting beyond that purpose. Quantitative ratings were organised in Excel and SPSS for descriptive analysis, and Content Validity Index (CVI) calculations were implemented in Excel using embedded formulas linked directly to the response cells to ensure transparent and reproducible computation. Open-ended responses were exported for thematic analysis and retained in their original wording for coding.

The analyses reported in this chapter address the study objectives and research questions outlined in Chapter 3. Quantitative findings are presented descriptively and, where appropriate, inferentially to examine implementation patterns and selected associations within Phase 1. Findings from the expert validation phase were presented to evaluate the relevance, clarity, simplicity, and practical acceptability of the electronic PNDP tool.
Results were presented in accordance with the CHERRIES reporting checklist for internet-based surveys (see Table 3.0). Findings were organised into four main components:

1. Sample characteristics
2. Quantitative results
3. Thematic qualitative findings
4. Integrated summary of quantitative and qualitative evidence

Expert validation findings followed a parallel structure, including characteristics of the expert panel, quantitative evaluation metrics, thematic feedback, and an integrated interpretation of the validation outcomes.
This chapter reports findings without interpretation; detailed discussion and contextualisation are presented in Chapter 5.

4.0.1 Demographics and sampling adequacy

The planned sample size was estimated at n = 218 based on 5% margin of error and 95% confidence level, and an estimated population size of 500 NDPs in Cyprus. A higher recruitment target of n=312 was set to account for anticipated 30% non-response and incomplete surveys. The achieved sample (n = 63) was therefore below the planned requirement, and inferential results are interpreted cautiously. Regarding the validation questionnaire, although 10 experts were targeted, the achieved panel (n = 7) remained within commonly used ranges for expert review in instrument content validation and was considered sufficient to support structured CVI appraisal alongside qualitative refinement.

4.0.2 Statistical analysis and data handling

For Phase 1, due to the small sample size and sparse crosstabulation cells, expected cell counts were examined before selecting inferential tests. When Chi-square assumptions were not met (>20% of cells with expected counts <5 and/or any expected count <1), exact tests were used. For larger contingency tables, Fisher–Freeman–Halton exact tests were reported. When computationally intensive, SPSS Monte Carlo estimation was used to estimate exact p-values. Monte Carlo estimation used 10,000 replications with a 99% confidence interval for the p-value estimate. Symmetric measures (Cramer's V) were reported as effect-size indicators and interpreted alongside cell distributions.

Where categories produced small expected counts, response options were collapsed using prespecified rules (e.g. combining "No" and "I don't know", i.e. for Questions 22 and 24). Statistical significance was evaluated at $\alpha = 0.05$. For families of related pairwise comparisons, p-values were adjusted using the Benjamini–Hochberg (BH) procedure to control the false discovery rate. A monotonicity step was applied to maintain rank order. These adjustments did not compromise statistical validity but reduced the risk of false-positive findings when many tests are performed. BH-adjusted p-values were computed in Excel using the standard BH formula.

Open-text responses provided under selected questionnaire items were examined manually and coded into recurring categories using a descriptive thematic approach. Given the small number and brief nature of these responses, the analysis was intended to support quantitative interpretation rather than constitute an in-depth qualitative analysis. Where applicable, the frequency of each theme was reported descriptively in the Results chapter.

For Phase 2 (validation questionnaire with embedded training components), content validity was quantified using the Content Validity Index (CVI) based on expert ratings collected within the online validation questionnaire (N = 7). For each item, experts rated Relevance, Clarity, and Simplicity on a 5-point Likert scale. Item-level CVI (I-CVI) was calculated as the proportion of experts assigning a rating of 4 or 5 (content-valid) divided by the number of valid ratings for that item. Scale-level CVI was summarised using S-CVI/Ave (mean I-CVI across items within each domain) and S-CVI/UA (proportion of items achieving universal agreement, i.e., all experts rating 4–5). All calculations were implemented directly in Excel using COUNT and COUNTIF formulas, with references linked to the original response cells. Further analyses of the thematic open-ended responses were conducted using IBM SPSS statistics (version 27).

4.0.3 Missing data

Missing data were handled on an item-specific basis, according to variable type, level of measurement, and item structure. For categorical items, blank or unanswered responses were treated as missing. For multiple-response items entered in SPSS as sets of dichotomous variables, a response option was coded as present only when explicitly selected; otherwise, it was treated as not endorsed within the coding structure of that item. Open-ended string variables were treated as missing when no text was. Where a coded non-response label (e.g. "No answer") was used, it was treated as a missing response rather than as substantive data. Optional contact information was excluded from substantive analysis and was not treated as analytic missing data. No missing data were observed for scale variables.

4.0.4 Multiple-response questions and duplication control

For questions allowing multiple selections, each option was converted to a binary variable (1 = selected, 0 = not selected). Because multiple themes could be endorsed by one participant, multiple-response sets were analysed descriptively using frequencies and multiple-response crosstabs. Inferential tests were not applied because mutual exclusivity assumptions are violated.

4.0.5 Priority rule for "All of the above" responses

For items that included "All of the above", the same priority rule was applied across questions. For example in Question 44: if "All of the above" was selected, any individual PNDP component selections by the same respondent were recoded to 0 and excluded from counts.

This ensured that each participant contributed once per item, either via "All of the above" or via a combination of specific selections.

4.1 Descriptive statistics and sample characteristics

4.1.1 Descriptive Statistics – Phase 1 (Phase 1 questionnaire)

A total of 63 nutrition and dietetic professionals completed Phase 1 Questionnaire (Appendix III). A summary of participants' characteristics is presented in Table 4.0. Two respondents reported practising outside Cyprus (Athens and the United Kingdom). These responses were retained because the respondents were Cypriot nutrition and dietetic professionals and because the achieved sample was below the planned target, making all additional data informative.

Table 4.0: Summary of Participants' Characteristics

Characteristic	n	%
Age Group		
22–25 years	25	39.7
26–30 years	23	36.5
31–45 years	12	19.0
46–59 years	2	3.2
≥60 years	1	1.6
City of Practice		
Nicosia	27	42.9
Limassol	16	25.4
Larnaca	8	12.7
Paphos	5	7.9
Famagusta	3	4.8
Athens	2	3.2
UK	1	1.6
Not currently practising	1	1.6
Primary Practice Setting		
Private office (independent)	38	60.3
Shared practice*	12	19.1
Home visits	7	11.1
Hospital/outpatient clinic	6	9.5
Professional Experience		

1 month	9	14.3
2–3 months	7	11.1
4–6 months	10	15.9
7–24 months	10	15.9
>25 months	27	42.9

*This category was later subdivided into collaborative and co-located practice in Table 4.4.

Respondents were predominantly within the lower practising experience groups, with a mean age of 27.4 years and a mean practising experience of 9.6 months (Tables 4.1 and 4.2 respectively). Most participants reported practising in Nicosia (n = 27) or Limassol (n = 16). Famagusta had the lowest count (n = 3). Figure 4.0 summarises respondent counts by city. Cities not listed individually are grouped as "Other cities (combined)" due to limited cell sizes.

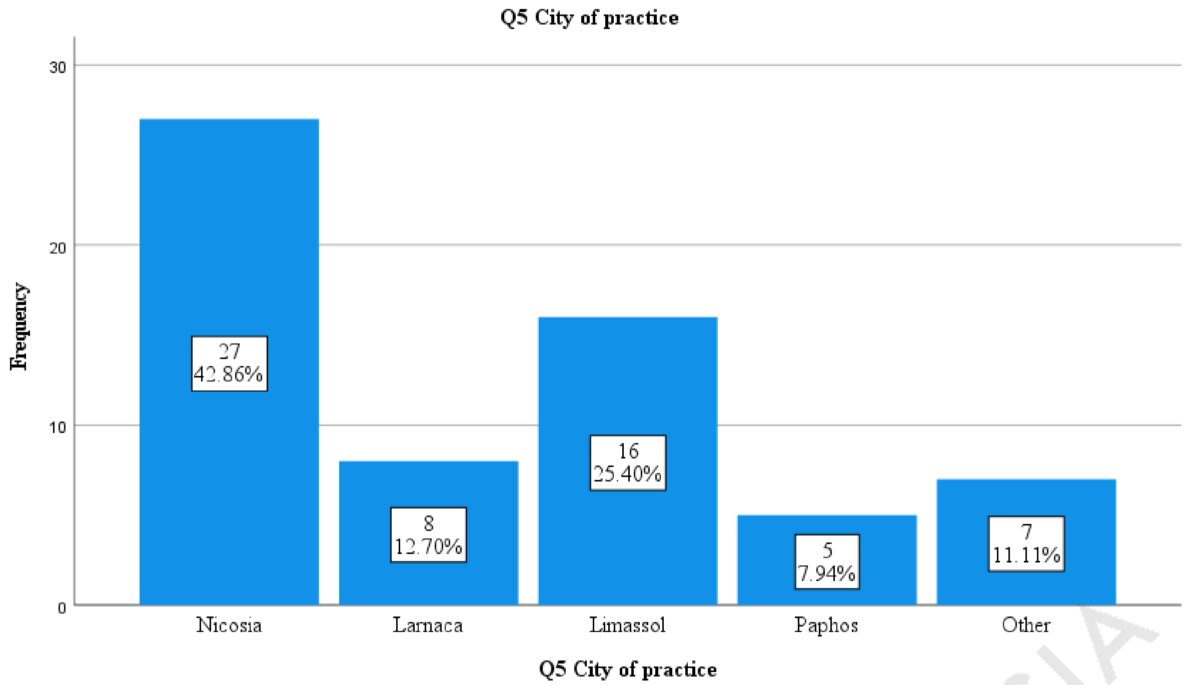
Table 4.1: Q4 Participants Age

	Frequency	Percent
22-25y.o.	25	39.7
26-30y.o.	23	36.5
31-45y.o.	12	19.0
46-59y.o.	2	3.2
>60y.o.	1	1.6
Total	63	100.0

Table 4.2: Q8 Practising experience in months

		Frequency	Percent
Valid	A month	9	14.3
	2-3 months	7	11.1
	4-6 months	10	15.9
	7-24 months	10	15.9
	>25 months	27	42.9
	Total	63	100.0

Figure 4.0. Respondent count by city of practice.



Practice-setting categories were refined for clarity (Table 4.3). Most participants worked in independent private practice (n = 38, 60.3%). Ten (15.9%) reported private practice with collaboration and two (3.2%) reported co-located practice without collaboration (Table 4.4). Fifty participants (79.4%) provided services within a city, four (6.3%) within a town and eight (12.7%) within a village (Figure 4.1).

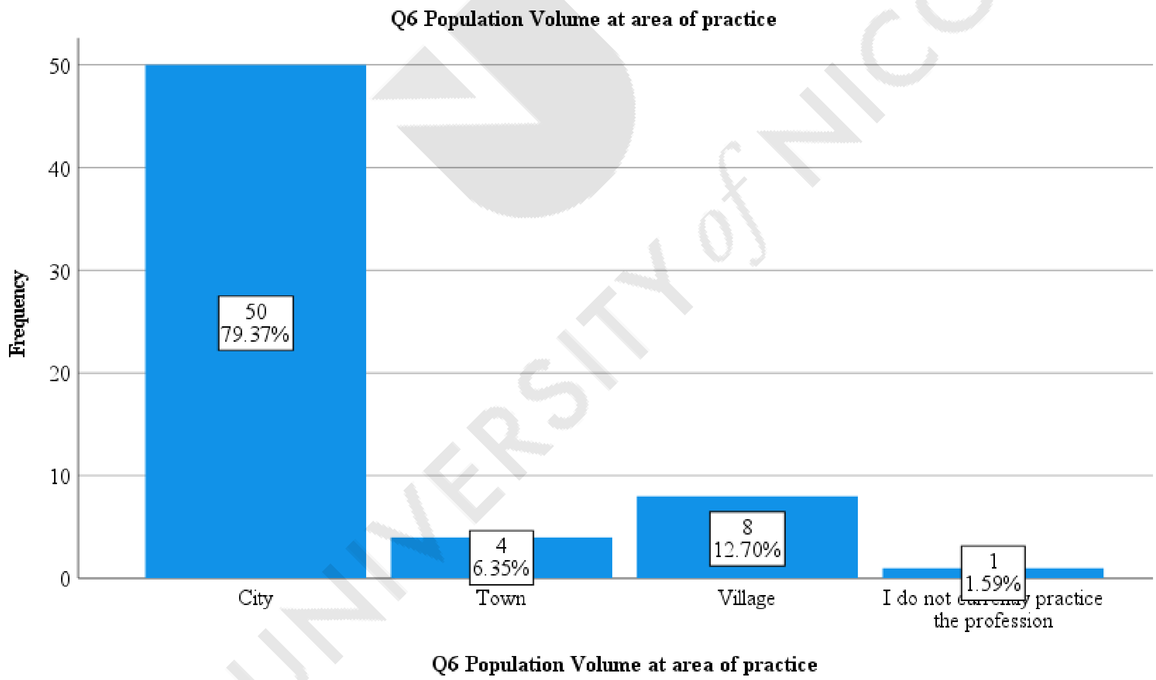
Table 4.3: Old and refined category name for the practice-setting category.

Old category name	New category name
Private office without other HCP	Independent private practice
Private office with other HCP, of which there is an established cooperation	Private practice with collaboration
Private office with other HCP, of which there is not an established cooperation	Co-located practice
Home visits	Home visits
Hospital, Government's healthcare facilities	Institutional setting

Table 4.4: Q7 Practice-settings.

		Frequency	Percent
Valid	Independent private practice	38	60.3
	Private practice with collaboration	10	15.9
	Co-located practice	2	3.2
	Home visits	7	11.1
	Institutional setting	6	9.5
	Total	63	100.0

Figure 4.1: Q6 Population volume at area of practice.

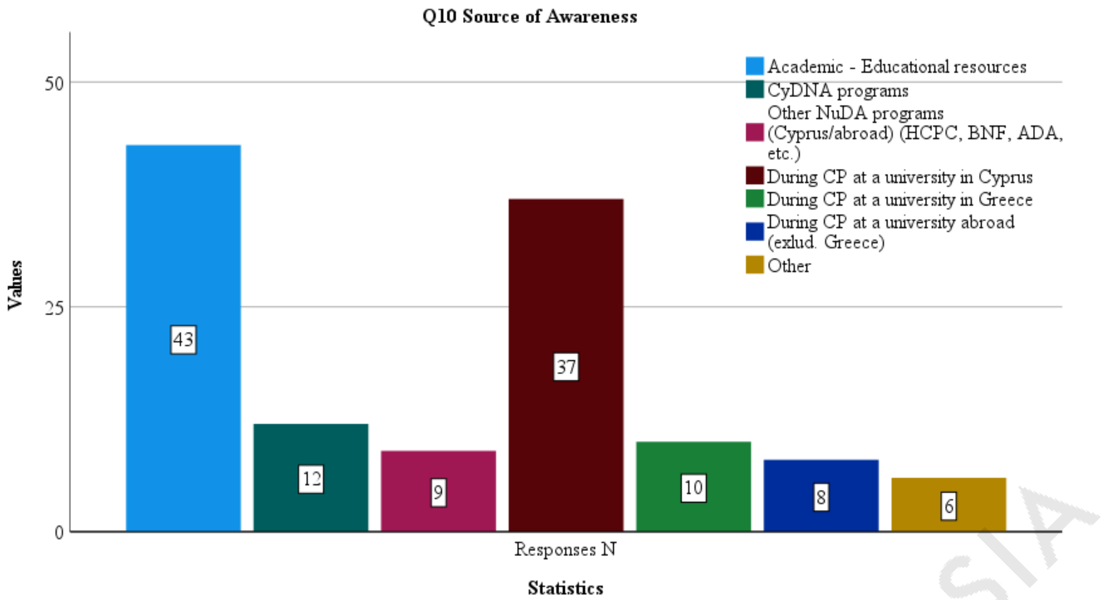


One participant (1.6%) reported not currently practising. Despite the inclusion criteria for practising NDPs, this case was retained because the achieved sample was below the planned target and all additional data were considered informative.

Awareness and use of documentation processes (DPs)
Sixty-two participants (98.4%) reported being aware of at least one DP. The most common sources of awareness were university seminars (43 endorsements; 68.3% of cases) and clinical placement exposure through a national university (37 endorsements; 58.7% of cases). Twelve

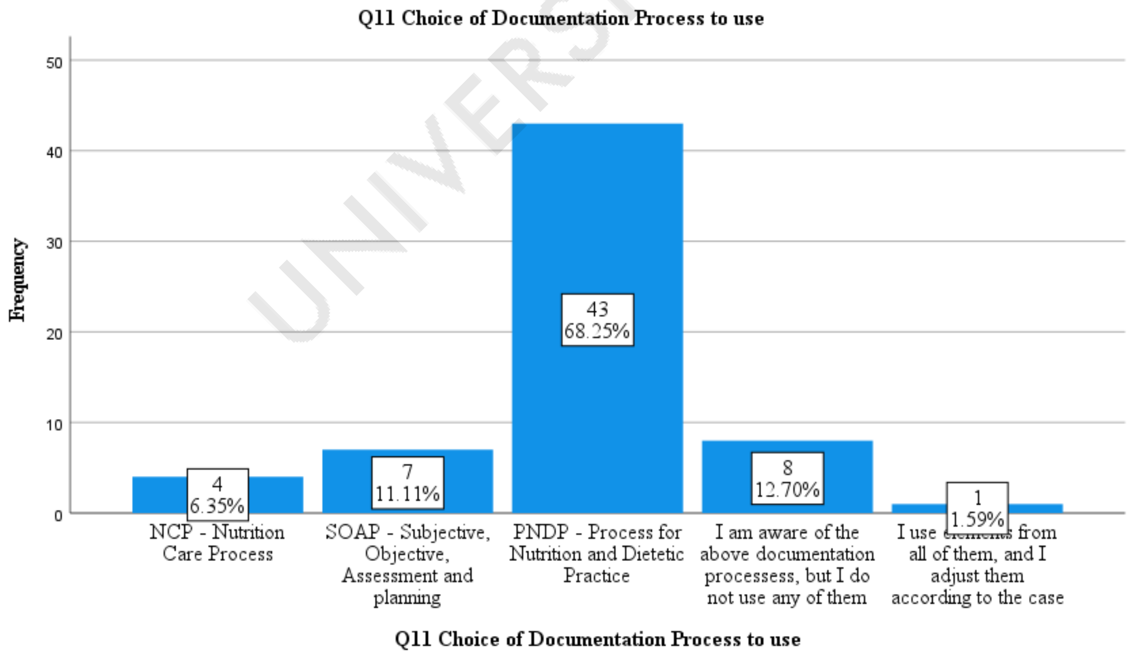
endorsements (19.0% of cases) were attributed to CyDNA educational programmes (Figure 4.2).

Figure 4.2: Q10 Source of awareness.



PNDP was the most frequently reported DP for clinical practice (n = 43; 68.3%). Eight participants (12.7%) reported being aware of a DP but not using one. SOAP was reported by seven participants (11.1%) and NCP by four (6.3%). One participant (1.6%) reported using elements from multiple DPs (Figure 4.3).

Figure 4.3: Q11 Choice of Documentation Process to use.



Key findings:

Almost all participants reported being aware of a documentation process (DP) (98.4%). The PNDP was the most commonly reported DP used in practice (68.3%). A smaller proportion of participants were aware of DPs but reported not using any (12.7%).

4.1.2 Descriptive statistics – Phase 3 (Expert validation questionnaire with embedded training components)

A total of seven experts completed the validation questionnaire (N = 7); demographic data were intentionally not collected. However, the professional composition of the expert panel was known from the purposive recruitment process and included clinical dietitians, nutritionists, and academics specifically including immunologists, a statistician, biochemists, and experts in physical education and nutrition. All provided informed consent and 57.1% consented to be named in the acknowledgements. Individual demographics such as age or location were not collected.

4.2 Quantitative results – Phase 1 (First Questionnaire)

4.2.1 Knowledge and extent of DP implementation (Q12, Q13)

Among those aware of a DP (n = 62), 46 (74.2%) rated their knowledge as "very good" and 15 (24.2%) as "little/minimum". Forty-five (72.6%) reported implementing a DP for all patients, nine (14.5%) for selected patients, and eight (12.9%) reported not using a DP.

When asked about the extent of DP implementation, 46 (73.0%) reported using all DP stages, 11 (17.5%) reported partial implementation, and six (9.5%) reported no DP use. Differences in the "non-use" count across items were treated as a consistency check; potential reasons include item interpretation and skip patterns.

4.2.2 Implementation of documentation process steps (Q16–Q18)

Question 16 assessed which SOAP steps participants implemented. Most respondents reported not using SOAP (n = 47, 74.6%). Among SOAP users (n = 16, 25.4%), eight participants reported completing all four SOAP components, four participants completed the first three components, and the remaining respondents reported partial completion patterns (Table 4.5).

Table 4.5: Steps of SOAP and their individual implementation rate (Q16).

		Responses		Percent of
		N	Percent	Cases
Q16 SOAP steps implementation	Subjective component	14	14.6%	22.2%
	Objective component	13	13.5%	20.6%
	Assessment component	14	14.6%	22.2%
	Plan component	8	8.3%	12.7%
	I don't use SOAP	47	49.0%	74.6%
Total		96	100.0%	152.4%

a. Dichotomy group tabulated at value 1.

Question 17 assessed implementation of the NCP. Overall, 48 participants (76.2%) reported not using the NCP, while 15 participants (23.8%) reported using one or more NCP steps. Among NCP users, nine participants reported completing all NCP steps (Nutrition Assessment, Nutrition Diagnosis, Nutrition Intervention, and Nutrition Monitoring and Evaluation), three reported completing the first three steps, two reported completing only the Nutrition Diagnosis, and one reported completing only Nutrition Monitoring and Evaluation (Table 4.6).

Table 4.6: Steps of NCP and their individual implementation rate (Q17).

		Responses		
		N	Percent	Percent of Cases
Q17 NCP steps implementation	Nutrition assessment	12	12.5%	19.0%
	Nutrition diagnosis	14	14.6%	22.2%
	Nutrition intervention	12	12.5%	19.0%
	Nutrition Monitoring and Evaluation	10	10.4%	15.9%
	I don't use the NCP	48	50.0%	76.2%
Total		96	100.0%	152.4%

a. Dichotomy group tabulated at value 1.

Question 18 assessed implementation of the Process for Nutrition and Dietetic Practice (PNDP). One participant was excluded from analysis due to inconsistent responses (reporting full PNDP implementation while also reporting non-use). Based on the remaining data, 15 participants (23.8%) reported not using PNDP. Among PNDP users (n = 47), 33 participants (70.2%) reported full implementation of all PNDP steps, while four participants (8.5%) reported completing all steps except Step 6 (Evaluation). The remaining PNDP users reported partial implementation (Table 4.7).

Table 4.7: Steps of PNDP and their implementation rates (Q18).

		Responses		
		N	Percent	Percent of Cases
Q18 PNDP steps implementation	Assessment	45	18.1%	95.7%
	Identification of Nutrition and Dietetic Diagnosis	46	18.5%	97.9%
	Plan Nutrition and Dietetic Intervention	44	17.7%	93.6%
	Implement Nutrition and Dietetic Intervention	39	15.7%	83.0%
	Monitor and Review	39	15.7%	83.0%
	Evaluation	36	14.5%	76.6%
Total		249	100.0%	529.8%

Based on 47 valid responses out of 63 total participants.

a. Dichotomy group tabulated at value 1.

Key findings:

Most respondents self-rated DP knowledge as “very good” and reported implementing a DP for all patients. Non-use counts differed slightly across items; this was flagged as a data-consistency issue rather than interpreted as a substantive change.

4.2.3 Perceived difficulty by DP and step (Q19-Q21)

SOAP: Most respondents indicated non-use (45/63; 71.4%), so step difficulty was not applicable for them. Among SOAP users (n = 18), 15 (83.3%) reported no difficult step; one identified the Assessment component and two the Plan component as most difficult.

NCP: Forty-one respondents (65.1%) reported non-use. Among NCP users (n = 22), 15 (68.2%) reported no difficult step; the most commonly cited difficult steps were Nutrition Diagnosis (n = 3) and Nutrition Intervention (n = 3).

PNDP: Ten respondents (15.9%) reported non-use. Among PNDP users (n = 53), 30 (56.6%)

reported no difficult step; the most commonly cited difficult steps were Nutrition Diagnosis (n = 9; 17.0%) and Nutrition Intervention (n = 9; 17.0%).

Key findings:
Across SOAP, NCP, and PNDP users, most respondents reported no difficult step. When difficulty was reported, diagnosis and intervention steps were most commonly identified.

4.2.4 Awareness of recommendations and international initiatives (Q22-Q24)

Responses to Question 22 were recoded into a dichotomous variable (Yes vs No), with "I don't know" collapsed into "No". Thirty-two participants (50.8%) believed CyDNA had published recommendations for a structured DP, and 31 (49.2%) did not.

The association between age group and this belief was not statistically significant (Fisher–Freeman–Halton $p = 0.301$). Cramer's V was 0.262, indicating a small-to-moderate association that was not supported by statistical significance in this sample.

For Question 24, sixteen participants (25.4%) reported awareness of EFAD's international consultation campaign; 47 (74.6%) reported no awareness after collapsing "I don't know" into "No". Age group was not significantly associated with awareness ($p = 0.609$; Cramer's V = 0.192).

Question 23 asked whether a standardised method for recording nutrition and dietetic care should be established. Thirty-two participants (50.8%) responded affirmatively. Twenty-three participants (36.5%) indicated that comparable stages could exist across dietetic and nutritional care, five participants (7.9%) reported that such a method may not be feasible, and three participants (4.8%) reported that it would not be useful or necessary.

Key findings:
Belief that CyDNA has DP recommendations was split roughly 50/50 and did not differ significantly by age group. Most participants were not aware of the EFAD consultation initiative.

4.2.5 Perceived relevance and adoption of standardised languages (Q26–Q27)

Question 26 asked participants to identify which nutrition and dietetic professionals (NDPs) could benefit from implementing a documentation process (DP), allowing multiple selections including an "All of the above" option. To avoid duplication, a prespecified priority rule was applied. Forty-five participants (71.4%) selected "All of the above". Excluding these cases, 18 valid cases (28.6%) contributed to 43 endorsements (238.9% of cases). Within these 18 cases, the most frequently selected group was NDPs working in hospitals (n = 14; 32.6% of participants; 77.8% of cases), followed by public health (n = 10; 55.6% of cases) and primary care (n = 7; 38.9% of cases) (Table 4.8).

Table 4.8: Groups perceived to benefit from implementing a DP (Q26).

Frequencies

		Responses		Percent of
		N	Percent	Cases
Q26 Who should implement a DP[a]	NDPs in hospitals	20	18.0%	31.7%
	NDPs in primary care	12	10.8%	19.0%
	NDPs in public health	14	12.6%	22.2%
	NDPs in research	10	9.0%	15.9%
	NDPs involved in the management / administration of nutrition and dietetic organisations / associations	8	7.2%	12.7%
	I don't know	2	1.8%	3.2%
	All the above NDPs	45	40.5%	71.4%
Total		111	100.0%	176.2%

a. Dichotomy group tabulated at value 1.

Question 27 examined which standardised language(s) participants currently use or would choose to use, allowing multiple responses per participant. All 63 participants provided valid responses, generating 95 total endorsements (150.8% of cases). The most frequently selected option was the PNDP (n = 41; 65.1% of cases), followed by the NCP (n = 18; 28.6% of cases) and SOAP (n = 15; 23.8% of cases). IDNT was selected by 12 participants (19.0% of cases). Other terminologies were endorsed less frequently (Table 4.9).

Table 4.9: Standardised language(s) used or preferred by participants (Q27).

		Responses		
		N	Percent	Percent of Cases
Q27 Which SL do you use or would prefer to use[a]	International Dietetics & Nutrition Terminology (IDNT)	12	12.6%	19.0%
	Nutrition Care Process (NCP)	18	18.9%	28.6%
	Subjective, Objective, Assessment, Plan (SOAP)	15	15.8%	23.8%
	Process for Nutrition and Dietetic Practice (PNDP)	41	43.2%	65.1%
	International Classification of Functioning, Disability & Health-Dietetics (ICF-D)	3	3.2%	4.8%
	Systematised Nomenclature of Medicine (SNOMED)	4	4.2%	6.3%
	Logical Observation Identifiers Names & Codes (LOINC)	1	1.1%	1.6%
	I can't say about the other languages, I've only practiced PNDP (collected from the "other" responses)	1	1.1%	1.6%
Total		95	100.0%	150.8%

a. Dichotomy group tabulated at value 1.

4.2.6 Introducing a standardised language in practice and education (Q30–Q36)

Question 30 explored participants' views on appropriate methods for introducing a standardised language (SL) in clinical settings, allowing multiple selections including "All of the above". Participants selecting "All of the above" (n = 36, 57.1%) were excluded from the multiple-response set, leaving 27 valid cases (42.9%). These 27 cases generated 89 coded endorsements (329.6% of cases). The most frequently endorsed method was educating and continuously training nutrition and dietetics professionals (n = 20; 74.1% of cases), followed by introducing an SL within electronic health records (n = 15; 55.6% of cases) (Table 4.10).

Table 4.10: Preferred methods for introducing an SL in clinical settings (Q30).

		Responses		
		N	Percent	Percent of Cases
Q30 Methods of introducing a SL at Clinical Settings[a]	By educating and continuously training the NDPs	20	16.0%	31.7%
	By introducing a SL in EHR	15	12.0%	23.8%
	By having EFAD and the MOH establishing a SL as one of the necessary elements of NDP practice in clinical settings	7	5.6%	11.1%
	Through practical workshops and action learning	8	6.4%	12.7%
	By allowing adequate time for education and adjustment	5	4.0%	7.9%
	By translating the SL	3	2.4%	4.8%
	By introducing a SL that is evidence based and functional	7	5.6%	11.1%
	By informing the NDPs about the benefits of a SL	6	4.8%	9.5%
	By introducing a new nutrition and dietetic approach that requires HCP liason through that newly introduced SL	11	8.8%	17.5%
	By switching towards a supportive nutrition care management team	5	4.0%	7.9%

	All of the above	36	28.8%	57.1%
	I don't know	2	1.6%	3.2%
Total		125	100.0%	198.4%

a. Dichotomy group tabulated at value 1.

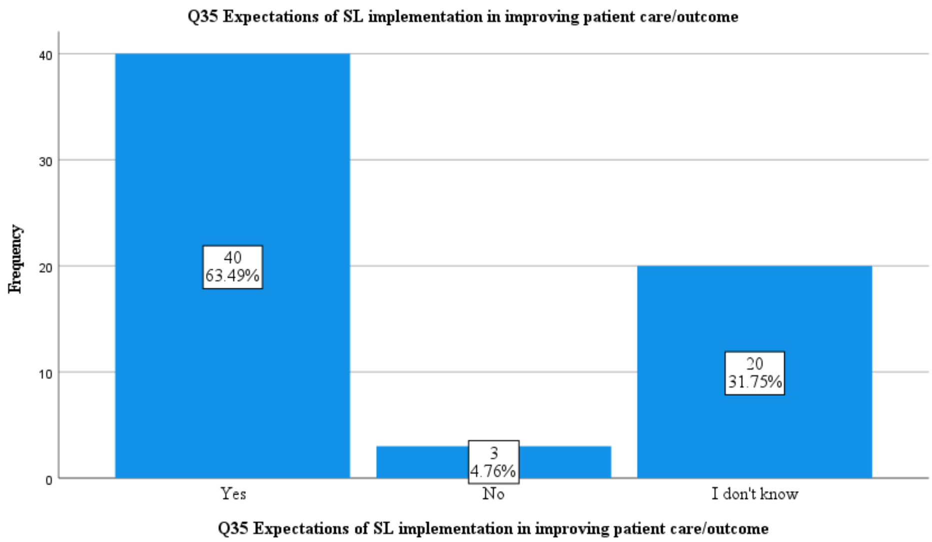
Question 31 examined preferred methods for introducing an SL in academic settings. Participants selecting “All of the above” (n = 31, 49.2%) were excluded from the multiple-response set, leaving 32 valid cases (50.8%). These generated 120 coded endorsements (375% of cases). The most frequently reported method was inclusion of an SL within the standard study curriculum (n = 25; 78.1% of cases), followed by supplying information through seminars and scientific journals (n = 15; 46.9% of cases) and educating practice-placement educators (n = 14; 43.8% of cases).

Question 32 asked participants to estimate the time required to introduce and implement an SL, reported in months. Responses reported as “I don’t know” or left blank were treated as missing (n = 8). Estimates ranged from 1.5 to 50 months. The most frequently reported estimates were 12 months (n = 16, 25.4%) and 6 months (n = 12, 19.0%). Other estimates were less frequent.

Question 34 asked whether using an SL has changed or is expected to change perceptions of the value of the nutrition and dietetic contribution among other healthcare professionals and NDPs. Most participants responded “Yes” (n = 40, 63.5%), while three participants responded “No” (4.8%) and 20 participants indicated “I don’t know” (31.7%).

Question 35 asked whether SL use would improve (a) the ability to audit patient care, (b) support an evidence-based approach when performing a nutrition care plan, and (c) improve patient care quality and outcomes. Forty participants (63.5%) responded “Yes”, three participants (4.8%) responded “No”, and 20 participants (31.7%) indicated “I don’t know” (Figure 4.4).

Figure 4.4: Expectations of SL implementation in improving question points a,b and c.



Question 36 explored considerations when deciding which SL framework would be most appropriate to introduce, allowing multiple responses including "All of the above". Participants selecting "All of the above" (n = 32, 50.8%) were excluded from the multiple-response set, leaving 31 participants (49.2%) included in descriptive analysis. Alignment with the current General Health System (GHS/ΓΕΣΥ) was the most frequently selected consideration (n = 24; 77.4% of cases), followed by implementation requirements (training needs and financial resources) (n = 17; 54.8% of cases) (Table 4.11).

Table 4.11: Considerations for selecting an SL framework to introduce (Q36).

		Responses		Percent of
		N	Percent	Cases
Q36 Considerations when introducing SL[a]	Current general health system (GHS/ΓΕΣΥ)	24	18.9%	38.1%
	The time of implementation and the training and financial resources required	17	13.4%	27.0%
	Education system	11	8.7%	17.5%
	A SL that may already be in effect by other HCPs	9	7.1%	14.3%
	Law and politics involved	7	5.5%	11.1%

	The documented development of relevant SL in the profession, from previous years	15	11.8%	23.8%
	Language considerations	2	1.6%	3.2%
	Relative benefits associated with SL	10	7.9%	15.9%
	All of the above	32	25.2%	50.8%
Total		127	100.0%	201.6%

a. Dichotomy group tabulated at value 1.

4.2.7 Education, professional bodies, and improvement needs (Q38)

Question 38 assessed whether participants were aware of an SL being taught during academic training. Most participants responded “Yes” (n = 43, 68.3%), while 13 participants responded “No” (20.6%) and seven indicated “I don’t know” (11.1%). For analytical purposes, responses were also recoded into a binary format (Yes vs not Yes).

4.2.8 Nutrition diagnosis knowledge and PNDP implementation challenges (Q42–Q47)

Question 42 assessed whether participants considered a medical diagnosis to be the same as a nutrition diagnosis. Most participants responded “No” (n = 39, 61.9%). Twenty-three participants (36.5%) selected “Sometimes”, and one participant (1.6%) responded “Yes”. One additional “other” response (“Obesity”) was categorised under “Sometimes”.

Question 43 assessed participants’ ability to identify a nutrition diagnosis, with one response permitted. “None of the above” was selected by 28 participants (44.4%), while “Weight loss” was selected by 26 participants (41.2%). Other options were selected less frequently (Table 4.12).

Table 4.12: Identification of a nutrition diagnosis (Q43).

	N	%
Hypothyroidism, unspecified	1	1.6%
GERD	6	9.5%
Weight loss	26	41.3%
Hypertension	2	3.2%
None of the above	28	44.4%

Question 44 examined participants' identification of PNDP components, allowing multiple selections including "All of the above". A priority rule was applied so that if "All of the above" was selected, individual component selections were unselected to avoid duplication. Most participants selected "All of the above" (n = 51, 81.0% of cases). Individual components were endorsed less frequently (Table 4.13).

Table 4.13: Components identified as part of the PNDP (Q44).

		Responses		Percent of
		N	Percent	Cases
Q44 Which options belong to PNDP, according to participants	Anthropometric Assessment	9	14.5%	75.0%
	Medical History and clinical symptoms	7	11.3%	58.3%
	Biochemistry	7	11.3%	58.3%
	Medical examinations	2	3.2%	16.7%
	24HR dietary recall	7	11.3%	58.3%
	Nutrition Goals	7	11.3%	58.3%
	Nutrition Plan	7	11.3%	58.3%
	Nutrition Intervention	7	11.3%	58.3%

	Monitoring and Evaluation	7	11.3%	58.3%
	None of the above	2	3.2%	16.7%
Total		62	100.0%	516.7%

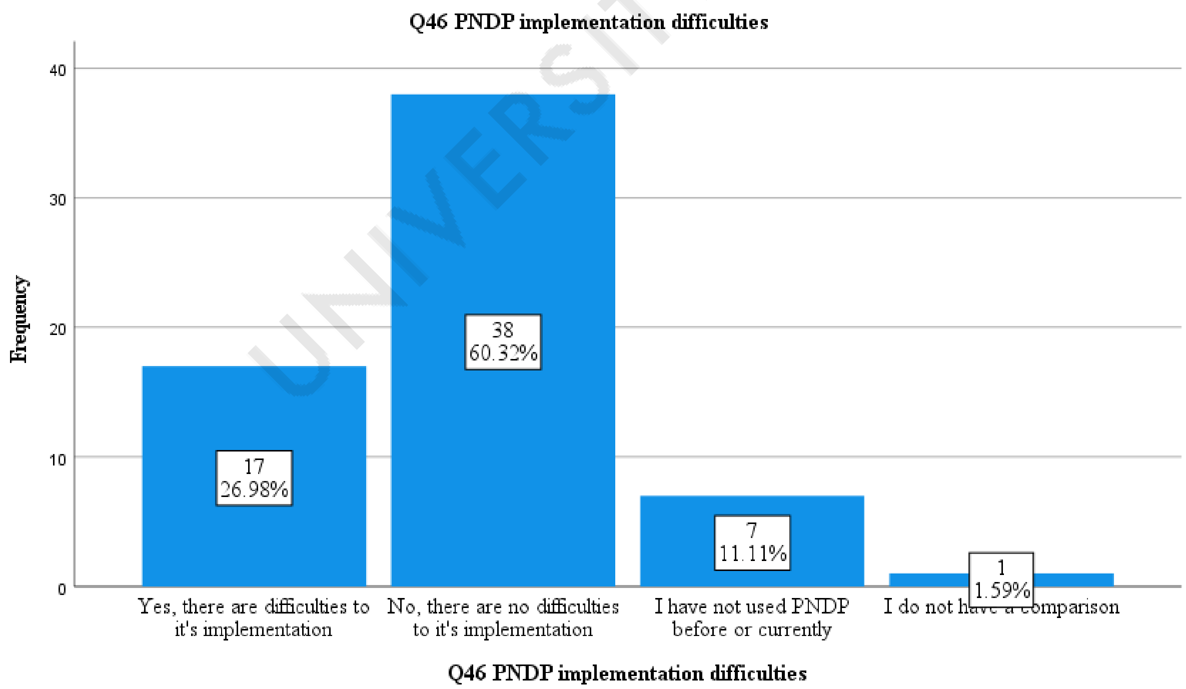
[a] Dichotomy group tabulated at value 1.

Note: For items that included an “All of the above” option, a priority rule was applied during coding to prevent double counting.

Question 45 assessed whether participants had previously used PNDP but no longer do so. Thirty-three participants (52.4%) reported having used PNDP in the past but not currently. Twenty-four participants (38.1%) reported not having used PNDP previously, and six (9.5%) did not remember.

Question 46 explored whether participants who currently use or have previously used PNDP perceived difficulties in its application. Seventeen participants (27.0%) reported that PNDP presents difficulties, while 38 participants (60.3%) did not perceive difficulties. Seven participants (11.1%) reported not having used PNDP currently or in the past. One participant (1.6%) indicated that they did not have a comparison to answer sufficiently (Figure 4.5).

Figure 4.5: Perceived PNDP difficulties among current or past users (Q46).



4.3 Quantitative results from Phase 3 (validation questionnaire with embedded training components)

The Content Validity Index (CVI) was used to quantify expert agreement regarding the content adequacy of the electronic PNDP tool across the domains of relevance, clarity, and simplicity. CVI provides structured evidence of content validity by summarising the extent to which a panel of experts judges each rated element to be appropriate and acceptable for its intended purpose. Item-level CVI (I-CVI) was calculated for each section as the proportion of experts assigning a rating of 4 or 5 on a 5-point scale (i.e. number of "agreement" ratings divided by the total number of experts), while scale-level CVI (S-CVI) was summarised both as the mean I-CVI across items (S-CVI/Ave) and as the proportion of items achieving universal agreement (S-CVI/UA, defined as I-CVI = 1.00). With n = 7 experts, an I-CVI of 0.86 corresponds to 6/7 experts rating the item as 4–5, while an I-CVI of 1.00 indicates 7/7 experts endorsed the item.

For panels comprising six or more experts, an I-CVI threshold of ≥ 0.78 was considered acceptable. An S-CVI/Ave value of ≥ 0.90 was interpreted as reflecting strong overall content validity (Polit & Beck, 2006; Polit et al., 2007).

Although CVI can be approximated in SPSS by recoding ratings into binary agreement (4–5 versus 1–3) and extracting the mean proportion per item, this approach is indirect because SPSS does not provide a dedicated CVI function or automated S-CVI outputs; consequently, additional manual steps are required to derive S-CVI/Ave and S-CVI/UA. For this reason, and to maximise transparency and reproducibility, CVI calculations were performed in Excel, where formulas could be embedded directly within the dataset, allowing clear documentation of all computational steps and facilitating auditability of the derived indices. Nine rated sections of the electronic PNDP tool (e-ΔΔΔΦ) were evaluated:

(1) Front Page

(2) Anthropometry Assessment

(3) Biochemistry Assessment

(4) Medical History

(5) Medication

(6) Nutrition and Dietetic Diagnosis

(7) Summary of Assessment

(8) Print or Save

(9) Print or Save (continued)

4.3.1 Scale-level CVI results by domain

Overall scale-level results supported high content validity across domains. For Relevance, I-CVI values ranged from 0.86 to 1.00, yielding S-CVI/Ave = 0.92 and S-CVI/UA = 0.44, meaning that 4 of 9 sections achieved universal agreement for relevance. For Clarity, I-CVI ranged from 0.86 to 1.00, with the highest overall scale mean (S-CVI/Ave = 0.94) and S-CVI/UA = 0.56 (5 of 9 sections with universal agreement), indicating particularly strong consensus that the content and presentation were understandable. For Simplicity, I-CVI ranged from 0.86 to 1.00, with S-CVI/Ave = 0.90 and S-CVI/UA = 0.33 (3 of 9 sections with universal agreement), suggesting that simplicity was rated positively overall, while also being the domain with the most frequent minor divergence in judgement (i.e., one expert rating <4 in several sections). Importantly, using the commonly applied adequacy criterion for panels of this size (I-CVI ≥ 0.78), all sections met the acceptability threshold across all three domains, indicating that no item required removal on content-validity grounds (Polit & Beck, 2006; Polit et al., 2007).

Overall, the Scale-Level Content Validity Index based on the average method (S-CVI/Ave) was 0.92, demonstrating high overall agreement across evaluated items. The Scale-Level Content Validity Index based on universal agreement (S-CVI/UA) was 0.44, indicating that 44% of items achieved complete agreement among all experts. Table 4.14 presents all item-level and scale-level CVI values in detail.

Table 4.14: Item and Scale level Content Validity Index.

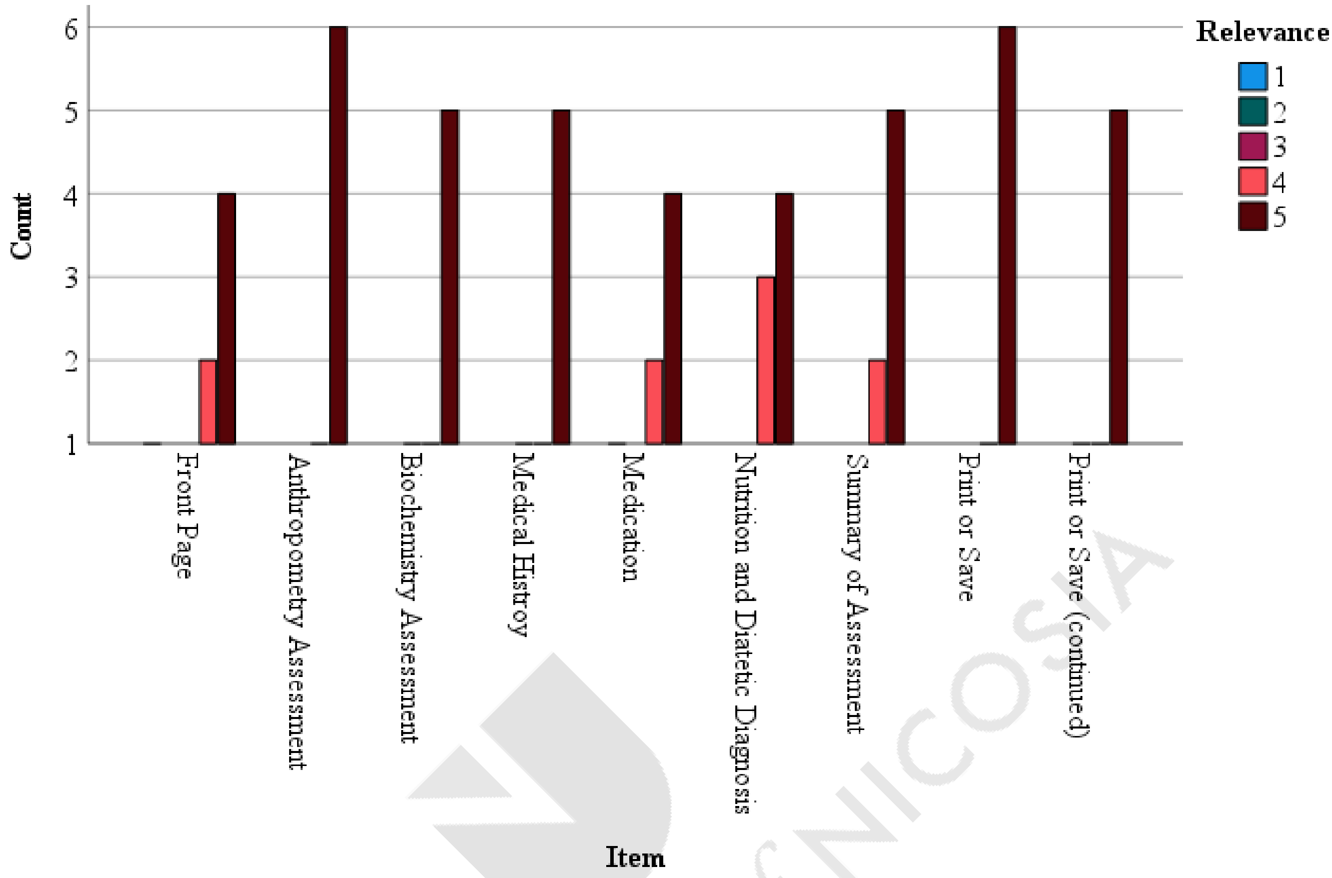
Section	Mean I-CVI
Section 1 – Front Page	0.86
Section 2 – Anthropometry Assessment	0.90
Section 3 – Biochemistry Assessment	0.90
Section 4 – Medical History	0.86
Section 5 – Medication	0.90
Section 6 – Nutrition and Dietetic Diagnosis	0.95
Section 7 – Summary of Assessment	1.00
Section 8 – Print or Save	1.00
Section 9 – Print or Save (continued)	0.90
S-CVI/Ave	0.92
S-CVI/UA	0.44

4.3.2 Item-level CVI patterns across the tool

At the item level, the distribution of I-CVI values showed a clear pattern: most sections were either endorsed by all experts (I-CVI = 1.00) or by all but one expert (I-CVI = 0.86). In practical terms, this means that disagreement—when present—was limited in magnitude (typically a single panel member rating the item below 4), rather than reflecting broad concern across the panel (Table 4.14).

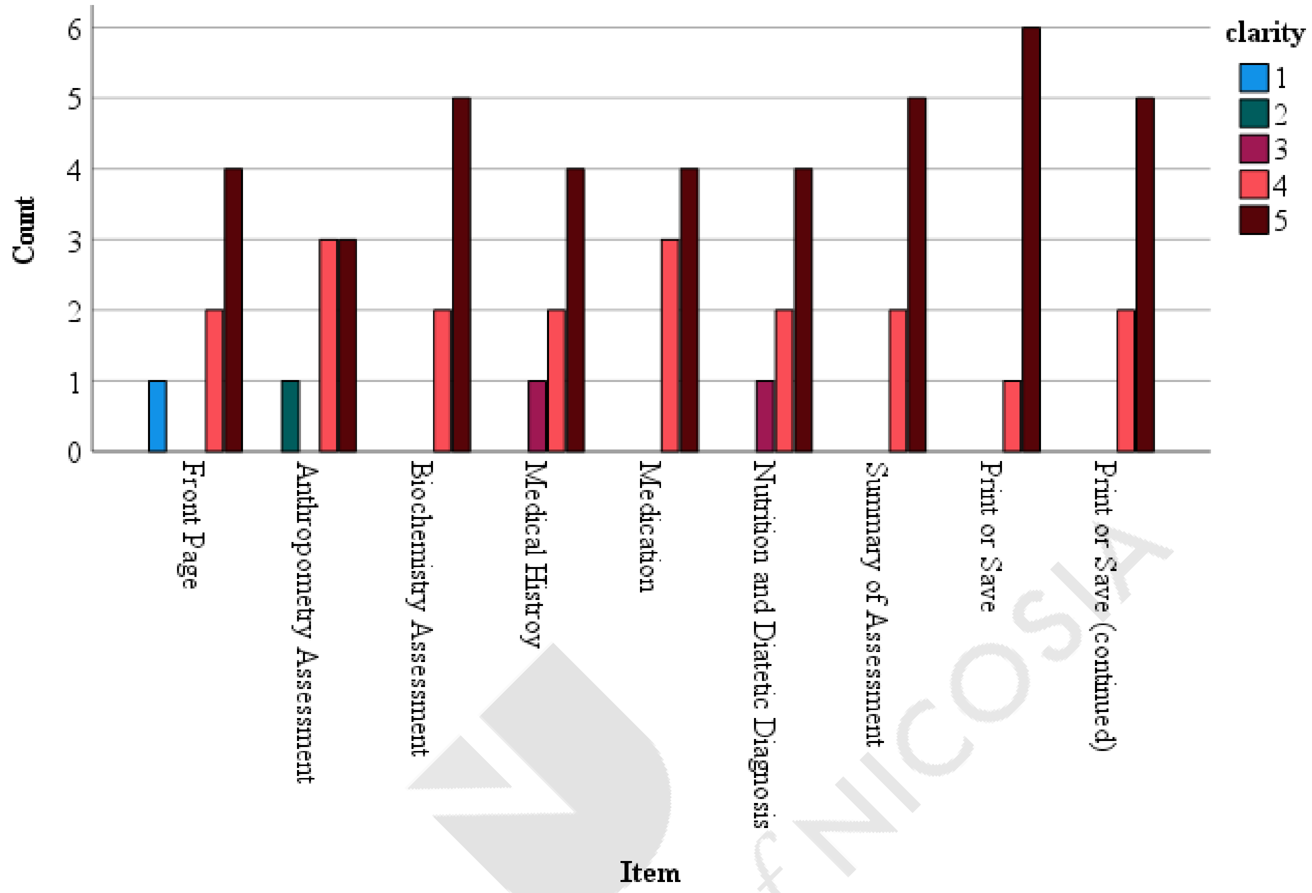
Relevance ratings were uniformly high, with universal agreement (I-CVI = 1.00) for four sections: Anthropometry Assessment, Nutrition and Dietetic Diagnosis, Summary of Assessment, and Print or Save (4/9 items). The remaining five sections reached I-CVI = 0.86 (6/7 experts): Front Page, Biochemistry Assessment, Medical History, Medication, and Print or Save (continued). This profile indicates that experts consistently judged the tool's sections as appropriate and meaningful for practice, with only isolated divergence in relevance judgements for specific sections (Figure 4.6).

Figure 4.6: Relevance rating across the nine evaluation items, from validation questionnaire.



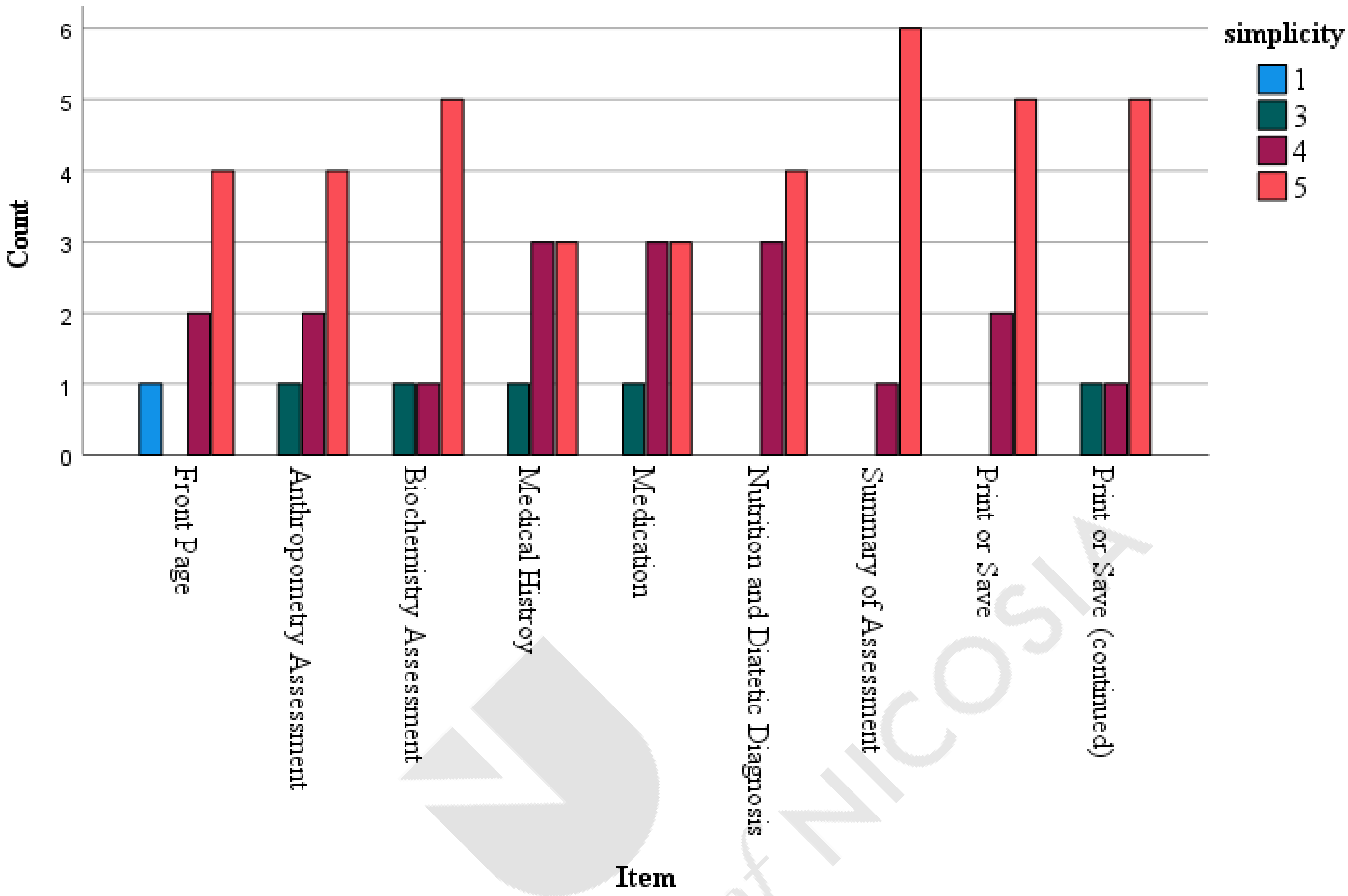
Clarity produced the strongest overall scale performance (highest S-CVI/Ave and S-CVI/UA), reflecting broad agreement that the tool content was understandable and appropriately expressed. Five sections achieved I-CVI = 1.00 for clarity: Biochemistry Assessment, Medication, Summary of Assessment, Print or Save, and Print or Save (continued) (5/9 items). Four sections scored I-CVI = 0.86 (6/7 experts): Front Page, Anthropometry Assessment, Medical History, and Nutrition and Dietetic Diagnosis. This pattern suggests that minor clarity issues—where they existed—were concentrated in early/interface-facing or content-dense areas, while the later output and reporting components were judged consistently clear (Figure 4.7).

Figure 4.7: Clarity rating across the nine evaluation items, from validation questionnaire.



Simplicity scores were also high, but with fewer items meeting the stricter criterion of universal agreement. Three sections reached I-CVI = 1.00 for simplicity: Nutrition and Dietetic Diagnosis, Summary of Assessment, and Print or Save (3/9 items). The remaining six sections all scored I-CVI = 0.86 (6/7 experts): Front Page, Anthropometry Assessment, Biochemistry Assessment, Medical History, Medication, and Print or Save (continued). This indicates that while experts generally considered the tool straightforward to use, simplicity was the domain most sensitive to small differences in judgement—likely reflecting how users weigh navigation effort, density of information, and perceived cognitive load when interacting with structured documentation templates (Figure 4.8).

Figure 4.8: Simplicity rating across the nine evaluation items, from validation questionnaire.



4.3.3 Interpretation in context of panel agreement

Taken together, the CVI findings demonstrate strong content validity across the tool, with particularly robust endorsement for clarity, followed by relevance, and then simplicity. The presence of many I-CVI values at 1.00 indicates that several sections were viewed as unequivocally acceptable by all experts. Meanwhile, items at I-CVI = 0.86 should be interpreted as near-universal endorsement rather than problematic performance, because they still represent agreement from six of seven experts, and all items remained above the acceptability benchmark. From a refinement perspective, the CVI profile helps prioritise where incremental improvement might yield the greatest usability gain: specifically, sections that repeatedly received 0.86 (particularly under simplicity and clarity) may benefit from minor adjustments (e.g., streamlining wording, reducing visual density, or improving navigation cues), even though they already meet accepted validity criteria.

In summary, CVI analysis supported the adequacy of the electronic PNDP tool's sections for relevance, clarity, and simplicity, with all nine sections meeting the accepted I-CVI threshold and strong scale-level indices across domains (S-CVI/Ave = 0.90–0.94). The pattern of agreement suggests that expert feedback reflected fine-tuning needs rather than substantive deficiencies, consistent with a tool that is broadly acceptable in content and presentation at the prototype stage.

4.4 Qualitative results – First Questionnaire

Open-ended responses were coded into themes. Initially keywords were attributed per answer to facilitate categorisation of themes. Coding was conducted by one researcher and reviewed by a second reviewer. Disagreements were resolved through discussion; unresolved cases were to be adjudicated by an external reviewer. Thematic results are presented with frequencies and where useful, exemplary quotes.

Examples from Q28 – Perceived benefits of SL use

"other HCPs will be able to communicate better their plan relating to a patient" – *"θα μπορούν οι επαγγελματίες υγείας να επικοινωνούν καλύτερα το πλάνο για κάποιο ασθενή"*

Keywords: "communication" and "team caring"

Categorised as: 1 – Better communication among HCPs and 8 – Multidisciplinary friendly and engaging

Example from Q29 – Perceived drawbacks of SL use

"The patient might not feel comfortable with the dietitian and resist sharing information as a result. The conversation [using a SL] will be limited to specific topics and some personal information that could be useful to the dietitian might not brought up." – "*Ο ασθενής ίσως να μην νοιώσει αμέσως οικειότητα απέναντι στον διαιτολόγο, με αποτέλεσμα να μην του ανοιχτεί απευθείας. Η συζήτηση κυμαίνεται σε συγκεκριμένα πλαίσια και μπορεί να μην αναφερθεί κάτι πιο προσωπικό από τον ασθενή, το οποίο ίσως να ήταν χρήσιμο για τον διαιτολόγο.*"

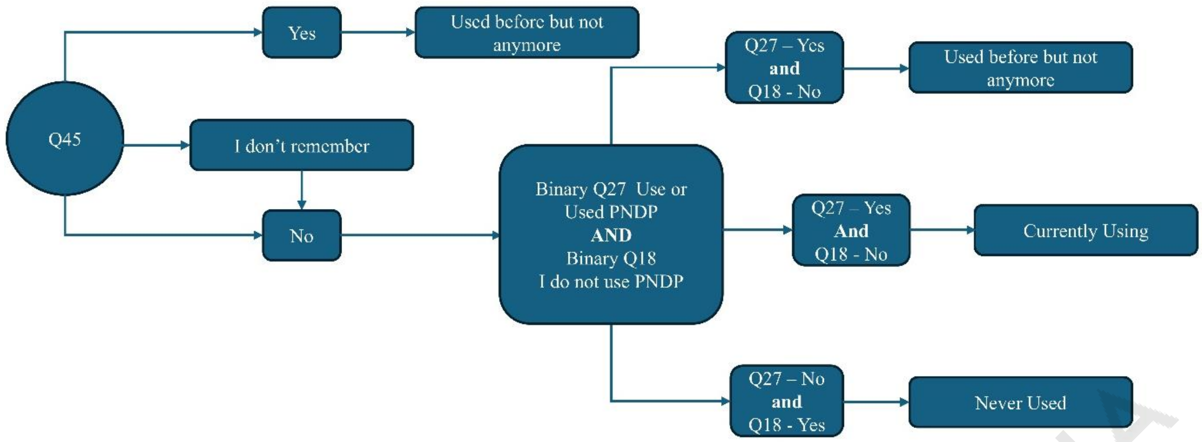
Keywords: "Patient experience", "missing information", "patients' reaction"

Categorised as: 3 – inapplicable in some cases (due to differences in patient reaction), 6 – missing information that might be necessary for full implementation, 10 – unsafe practice (the patient withholds important information), 12 – poor patient experience.

4.4.1 Specific handling of results

For the multiple-response crosstabulation between Q28 and Q45 as well as Q29 and Q45, new PNDP binary variables had to be reconstructed to resolve ambiguity in PNDP use status. The new binary variables classified participants as: (a) current PNDP users, (b) previous but not current PNDP users and (c) never PNDP users. Classification rules combined information from Q45 ("used PNDP in the past but not currently"), Binary Q27 derived from the original Q27 categorical variable and indicating selection of PNDP as currently or previously used, and Binary Q18 derived from the original Q18 categorical variable and indicating selection of "I do not use PNDP". Figure 4.9 provides a simplified logic flow for transparency.

Figure 4.9: Logic flow for PNDP user status derivation.



To prevent double counting when an "All of the above" option was available, a priority rule was applied. If a participant selected "All of the above", all corresponding individual options were recoded from 1 to 0 for that participant, and only the "All of the above" endorsement was retained. This rule was applied consistently across all relevant items (e.g. Q26, Q30, Q31, Q36, Q44). The recoding was validated by manually checking a random subsample of 60 cases against raw response patterns, and no discrepancies were found.

4.4.2 Use of a documentation process for selected patient cases (Q14)

Question 14 was an open-ended item that asked respondents who reported using a DP only for selected cases to describe the types of patients for whom they apply a documentation process. Four NDPs reported using a DP for patients with one or more health conditions requiring medical attention (n = 4, 30.8% of responses, 11.1% of cases). Reported triggers included medication administration or abnormal laboratory values, renal conditions (including diabetic nephropathy), chronic illness(es) or visits through the General Health System (GHS/ΓΕΣΥ), and complex health status not requiring urgent medical supervision.

4.4.3 Perceived meaning of "standardised language" (Q25)

Responses were coded into eight themes, with multiple themes allowed per participant. For analysis, two related themes a) standardised terms or language among healthcare professionals to facilitate effective communication (n=41, 65.1%) and b) standardised terms or language among dietitians (n=9, 14.3%), were collapsed into a single category. Responses that were unclear (n=1, 1.6%) to the research team and responses that were missing (n=3, 4.8%), were also collapsed into one category.

The most frequent category was “standardised terms among healthcare professionals and dietitians” (79.4% of cases). “Process or framework or template understood across professionals” appeared in 22.2% of cases. Remaining categories were each <6% of cases.

Key findings:

Most respondents defined standardised language as shared terminology enabling communication across professionals. Less common definitions focused on templates/processes; unclear/missing responses were uncommon.

4.4.4 Perceived benefits of a standardised language (Q28)

Multiple-response analysis yielded 136 coded responses (215.9% of cases). The most frequently coded benefit was “better communication/clearer documentation and record keeping” (73.0% of cases). Other common benefits were “structure and consistency” (31.7%) and “improved patient care/outcomes” (23.8%).

Examples from the four most common themes were:

1) “Better communication among healthcare professionals/dietitians, including clearer documentation and record keeping”, identified by 46 participants (33.8% of responses, 73% of cases)

“The notes are understandable by any other healthcare professional with knowledge of the standardized communication language” – “Οι σημειώσεις γίνονται κατανοητές από οποιοδήποτε άλλο επαγγελματία υγείας με γνώση της τυποποιημένης γλώσσας επικοινωνίας”
“Better communication with comprehension” – “Πιο καλη επικοινωνια με κατανοηση”

2) “Enables structure and consistency” identified by 20 participants (14.7% of responses, 31.7% of cases)

“you know where to find what you are looking for” (original comment was in English)
“planning/organisation” – “Οργάνωση”

3) “Improved patient care or outcomes”, identified by 15 participants (11% of responses, 23.8% of cases).

“improvement of dietetic practice” – “βελτίωση της διαιτολογικής πράξης”
“better outcome” – “Καλύτερα αποτελέσματα”

and 4) “multidisciplinary friendly or engaging”, identified by 13 participants (9.6% of responses, 20.6% of cases)

“communication with colleagues who are monitoring the same person before or after me” – “συνεννόηση με συναδέλφους που παρακολουθούν το ίδιο άτομο πριν ή μετά από μένα”

“The opportunity for better communication and collaboration with other healthcare professionals” – “Η ευκαιρία για καλύτερη επικοινωνία και συνεργασία με άλλους επαγγελματίες υγείας”

Key findings:

Communication and documentation clarity were the dominant perceived benefits. Structure/consistency and patient-care improvement were the next most common benefits.

4.4.5 Perceived drawbacks of a standardised language (Q29)

Multiple-response analysis yielded 85 coded responses (134.9% of cases). The most frequently coded drawback was “time-intensive/long process” (33.3% of cases). “Training/education required” was the second most common drawback (23.8% of cases).

Examples from the three most common themes were:

1) “Time intensive processes”, including perceptions of lengthy completion, identified by 21 participants (24.7% of responses, 33.3% of cases)

“Time-consuming process” – “Χρονοβόρα διαδικασία”

“Time to complete the document” – “Χρόνος συμπλήρωσης εντύπου”

2) “Prior training and education required” encompassing complexity, lack of clarity, or unfamiliar terminology identified by 15 participants (17.6% of responses, 23.8% of cases)

“Training of all professionals from the beginning, new and old” – “Εκπαίδευση όλων των επαγγελματιών από την αρχή, νέων και μη”

“Not all health professionals are specialists with a standardized communication language” – “Να μην είναι όλοι οι επαγγελματίες υγείας εξειδικευμένοι με τυποποιημένη γλώσσα επικοινωνίας”

3) “Interference with workflow” identified by 8 participants (9.4% of responses, 12.7% of cases)

"Workflow limitation" – "Περιορισμός στο work flow"

"It's difficult to change someone's ways and force them to operate in a different way than they learned" – "Δύσκολο να αλλάξεις τον τρόπο του καθενώς και να τον υποχρεώσεις να λειτουργεί με άλλο τρόπο από αυτον που έμαθε"

Key findings:

Time burden and training needs were the most common perceived barriers. Workflow interference and translation/interpretation concerns were reported less frequently.

4.4.6 Environments where a standardised language could be useful (Q33)

Question 33 explored the environments in which an SL could be useful. Responses were coded into thematic categories and analysed as a multiple-response set. Eight participants did not provide a response and were treated as missing. Across valid responses, 80 coded endorsements were recorded. The most frequently reported environment was clinical settings (inpatient and outpatient) (n = 40; 72.7% of cases), followed by private practice (outpatient) (n = 17; 30.9% of cases) (Table 4.15).

Table 4.15: Environments in which an SL could be useful (Q33).

		Responses		Percent of Cases
		N	Percent	
Q33 Environments where participants believe using a SL would be useful	Clinical (Inpatient, outpatient)	40	50.0%	72.7%
	Academic	5	6.3%	9.1%
	Public Health (communication, pharmacy, other HCP)	6	7.5%	10.9%
	Private practice (outpatient)	17	21.3%	30.9%
	Online services	2	2.5%	3.6%
	By All dietitians in all HC fields	8	10.0%	14.5%

	I don't know	2	2.5%	3.6%
Total		80	100.0%	145.5%

a. Dichotomy group tabulated at value 1.

4.4.7 Education, professional bodies, and clinical placement exposure (Q37, Q39–Q41)

Question 37 collected open-ended responses on SL use during clinical placement, allowing multiple SL-related themes per participant. Non-responses and explicit reports of no SL use were collapsed into a non-user category. The most frequently reported SL used during clinical placement was PNDP (n = 33, 52.4%). Smaller proportions reported SOAP (n = 3, 4.8%), NCP (n = 2, 3.2%) and IDNT (n = 2, 3.2%). A total of 14 participants (22.2%) were classified as not having used an SL during clinical placement (Table 4.16).

Table 4.16: Standardised language use during clinical placement (Q37).

		Responses		Percent of Cases
		N	Percent	
Q37 SL taught during studies or clinical placement[a]	NCP	2	3.2%	3.2%
	SOAP	3	4.8%	4.8%
	PNDP	33	52.4%	52.4%
	IDNT	2	3.2%	3.2%
	A SL was used, but the specific SL was not reported by the participant	4	6.3%	6.3%
	No SL was used	8	12.7%	12.7%
	Another specified SL was used, that was developed/provided by the University/placement facility	1	1.6%	1.6%
	No answer	6	9.5%	9.5%

	NCP, SOAP, PNDP	3	4.8%	4.8%
	SOAP, PNDP, other SL specified by the University/placement facility	1	1.6%	1.6%
Total		63	100.0%	100.0%

a. Dichotomy group tabulated at value 1.

Question 39 asked which SL should be taught for different professional environments. Responses were coded into thematic categories and analysed as a multiple-response set. Valid responses were provided by 57 participants (90.5%), with six treated as missing. Across valid responses, 63 coded endorsements were recorded (110.5% of cases). The most frequent category was PNDP without specifying an environment (n = 21; 36.8% of cases), followed by "I don't know" (n = 13; 22.8% of cases) (Table 4.17).

Table 4.17: Thematic coding of Participants' preferred SL to be taught by environment (Q39).

		Responses		
		N	Percent	Percent of Cases
Q39 Participants' preferred SL to be taught by environment [a]	Theme 1: NCP for academic/clinical placement environment	1	1.6%	1.8%
	Theme 2: NCP, unspecified environment	4	6.3%	7.0%
	Theme 3: PNDP for academic/clinical placement environment	1	1.6%	1.8%
	Theme 4: PNDP clinical/workplace environment	2	3.2%	3.5%

	Theme 5: PNDP, unspecified environment	21	33.3%	36.8%
	Theme 6: SOAP for clinical/workplace environment	2	3.2%	3.5%
	Theme 7: SOAP, unspecified environment	3	4.8%	5.3%
	Theme 8: IDNT, unspecified environment	1	1.6%	1.8%
	Theme 9: SNOMED for clinical/workplace	1	1.6%	1.8%
	Theme 10: Any SL	5	7.9%	8.8%
	Theme 11: The one that is currently being used the most	2	3.2%	3.5%
	Theme 12: The one that is proven to be correct per environment	5	7.9%	8.8%
	Theme 13: I don't know	13	20.6%	22.8%
	Theme 14: I consider this question unclear or too broad	2	3.2%	3.5%
Total		63	100.0%	110.5%

a. Dichotomy group tabulated at value 1.

Question 40 examined whether participants perceived that the Cyprus Nutrition and Dietetic Association (CyDNA) promotes use of a particular SL. Four participants provided no response and were treated as missing. Among 59 valid responses, 28 participants (44.4%) reported that CyDNA promotes PNDP. Fourteen participants (22.2%) responded “I don’t know” and 14 participants (22.2%) reported “No”.

Question 41 asked participants what could be improved in current SLs. Responses were coded into thematic categories and analysed as a multiple-response set. Fifty-eight participants

(92.1%) provided a valid response and five were treated as missing. Across valid responses, 61 endorsements were recorded (105.2%). The most frequently reported theme was the need for more education, training, or practice with examples/case studies (n = 16; 27.6% of cases). Time efficiency (SLs being more direct) and no improvement necessary were each reported by 10 participants (Table 4.18).

Table 4.18: Thematic coding of Participants' recommendations on improvements to current SLs (Q41).

		Responses		
		N	Percent	Percent of Cases
Q41 Participants' recommendations on improvements to current SLs[a]	Theme 1: Adopt a shorter structure	1	1.5%	1.6%
	Theme 2: To be more direct/time-effective (fast but effective)	10	15.2%	15.9%
	Theme 3: To be more comprehensible	3	4.5%	4.8%
	Theme 4: Reduce repetition in steps	1	1.5%	1.6%
	Theme 5: A manual to come with SLs to aid their completion	1	1.5%	1.6%
	Theme 6: There is a space for improvement, but no recommendations were given	3	4.5%	4.8%
	Theme 7: I don't know	11	16.7%	17.5%
	Theme 8: No improvement is necessary	10	15.2%	15.9%

	Theme 9: When composing a new meal plan	1	1.5%	1.6%
	Theme 10: When composing a nutrition diagnosis (to be clearer)	2	3.0%	3.2%
	Theme 11: More education/training/practice with examples - case studies	16	24.2%	25.4%
	Theme 12: Better planning around its use	1	1.5%	1.6%
	Theme 13: More choices on SL	1	1.5%	1.6%
	No answer	5	7.6%	7.9%
Total		66	100.0%	104.8%

a. Dichotomy group tabulated at value 1.

4.4.8 Examples of perceived difficulties in implementing PNDP (Q47)

Question 47 used an open-ended format to capture perceived PNDP implementation difficulties, allowing multiple themes per participant. Fourteen participants (22.2%) provided a valid response, while 49 participants (77.8%) did not provide an answer. Reported themes were coded into binary variables for descriptive analysis (Table 4.19).

Table 4.19: Thematic presentation of Perceived difficulties when implementing the PNDP (Q47).

		Responses		Percent of Cases
		N	Percent	
	Theme 1: Time-consuming/Long	7	10.8%	11.3%

Q47 Perceived Difficulties when implementing the PNDP[a]	Theme 2: It's in printed format/Manual Format	1	1.5%	1.6%
	Theme 3: Nutrition Diagnosis - hard to articulate	4	6.2%	6.5%
	Theme 4: Repetitive	1	1.5%	1.6%
	Theme 5: Some of the information necessary for its completion is sometimes not available	1	1.5%	1.6%
	Theme 6: Not feasible to complete for all patients	1	1.5%	1.6%
	Theme 7: Nutrition Problem (PAS) - hard to articulate	1	1.5%	1.6%
	No answer	49	75.4%	79.0%
Total		65	100.0%	104.8%

a. Dichotomy group tabulated at value 1.

4.4.9 Summary of key results from the First Questionnaire - Integration of quantitative and qualitative findings

Most respondents reported being aware of a documentation process (98.4%), and the PNDP was the most commonly used framework in practice (68.3%). Among those who reported using a documentation process, most indicated that they implement all stages (73.0%). Participants described the main benefits of using a standardised language as improved communication and clearer documentation (73.0% of cases), followed by better structure and consistency. In contrast, the most frequently reported drawbacks related to the time required to complete the process and the need for additional training.

4.5 Qualitative feedback: Expert validation questionnaire

Open-ended expert feedback was coded into five themes: (1) interface and visual readability, (2) wording and terminology, (3) content completeness and clinical detail, (4) workflow and functionality preferences, and (5) overall acceptability. As shown in Table 4.20, most entries contained no comment (n = 41; 65.1%). Among responses that included narrative feedback, the most frequent single-theme category related to interface and visual readability (n = 7; 11.1%), followed by workflow and functionality preferences (n = 5; 7.9%) and wording and terminology (n = 4; 6.3%). Less frequent were comments coded under content completeness and clinical detail (n = 1; 1.6%) and overall acceptability (n = 1; 1.6%). A small number of responses were coded into combined categories (e.g. readability plus wording; wording plus workflow; content completeness plus workflow), indicating overlap between presentation- and functionality-related suggestions.

Using multiple-response coding (allowing more than one theme per comment), Table 4.21 summarises 26 coded theme instances. The most frequently coded themes were interface and visual readability (n = 8; 30.8% of responses; 36.4% of cases) and workflow and functionality preferences (n = 8; 30.8% of responses; 36.4% of cases), followed by wording and terminology (n = 6; 23.1% of responses; 27.3% of cases). Content completeness and clinical detail accounted for 11.5% of coded instances (n = 3; 13.6% of cases), while overall acceptability was least frequent (n = 1; 3.8% of responses; 4.5% of cases). The total percentage of cases exceeded 100% (118.2%) because multiple themes could be assigned per case.

Across tool sections, the most common suggestions concerned improving screenshot readability (e.g. larger images/fonts), minor editorial consistency, clearer wording in selected prompts, and the addition of specific clinical fields (e.g. "current weight" and date fields). Several comments also referred to functions or fields that were already present within the prototype, indicating that some feedback reflected limited recognition of existing features during evaluation.

Table 4.20: New Theme appearance from Experts

	N	%
No comment	41	65.1%
Interface and visual readability	7	11.1%
Interface and visual readability, Wording and Terminology	1	1.6%
Wording and terminology	4	6.3%

Wording and terminology, Workflow and functionality preferences	1	1.6%
Content completeness and clinical detail	1	1.6%
Content completeness and clinical detail, Workflow and functionality preferences	2	3.2%
Workflow and functionality preferences	5	7.9%
Overall acceptability	1	1.6%

Table 4.21: Experts Opinions Frequencies

		Responses		
		N	Percent	Percent of Cases
Experts' Opinions[a]	Theme 1: Interface and visual readability	8	30.8%	36.4%
	Theme 2: Wording and Terminology	6	23.1%	27.3%
	Theme 3: Content completeness and clinical detail	3	11.5%	13.6%
	Theme 4: Workflow and functionality preferences	8	30.8%	36.4%
	Theme 5: Overall acceptability	1	3.8%	4.5%
Total		26	100.0%	118.2%

a. Dichotomy group tabulated at value 1.

4.6 Final electronic Greek PNDP tool (e-ΔΔΔΦ)

The electronic PNDP tool (e-ΔΔΔΦ) was produced through an iterative, practice-driven development pathway that translated the PNDP into a structured digital workflow in Greek. The resulting prototype operationalised the four PNDP stages: assessment, diagnosis, intervention, and monitoring/evaluation within a template-based interface intended to reduce reliance on narrative-only documentation and to support consistent capture of clinical reasoning. The final tool comprised discrete documentation modules corresponding to core components of dietetic assessment and care, including beneficiary characteristics, anthropometry, medical history, medication, and nutrition diagnosis. These modules were implemented within a spreadsheet-based prototype capable of generating, clearing, and reformatting tables dynamically according to user selections (e.g. checkboxes and dropdown menus), enabling case-specific documentation pathways without requiring reconfiguration of the template for each patient encounter.

A central output of the development process was a structured pathway for nutrition diagnosis formulation. This component was scaffolded through guided statement construction (Problem, Aetiology, Signs/Symptoms; PAS), supported by selectable diagnostic elements and preformatted sentence options, as informed by the ADA (2006). These design features were incorporated to reduce cognitive burden, strengthen consistency of diagnostic language, and maintain traceability between assessment evidence and diagnostic conclusions. In addition, the tool incorporated practical clinical supports (e.g. standardised fields and curated prompts such as medication–nutrient interaction considerations), such that documentation was not only recorded but actively guided by the interface.

To support coherent reporting, the tool generated a consolidated report-style output through a dedicated "Summary of e-ΔΔΔΦ" view, where content from individual modules could be compiled into a single clinical note format. Automated formatting routines were embedded to maintain readability and layout integrity of the compiled output, including functions that reduce excessive spacing between copied sections. Collectively, these features positioned the final prototype as both a documentation template and an implementation mechanism, structuring not only what information is recorded but also how clinical reasoning is expressed and presented as a coherent, auditable summary.

From a technical perspective, implementation within a spreadsheet environment supported by scripting logic resulted in a modular system that could be extended and adapted (e.g., adding modules, modifying titles, and updating translation mappings) while remaining usable for routine documentation. Overall, the developed prototype provided a context-adapted electronic PNDP documentation workflow that prioritised standardisation, traceable clinical reasoning, and clear summary outputs, while remaining feasible within the constraints of local digital infrastructure. A short indicative manual of the resulting electronic tool is presented in Table 4.22.

Overall, the development and expert evaluation phases supported the relevance, clarity, and simplicity of the electronic PNDP tool, while qualitative feedback identified areas for refinement in presentation, readability, and workflow-related features. A more detailed account of these validation findings is provided in the published manuscript on the development and content validation of the e-PNDP tool (Appendix XI). Collectively, these findings support the feasibility and early practical acceptability of the prototype as a context-adapted electronic documentation tool for use in Cyprus.

Table 4.22: Short user guide for the electronic Greek PNDP tool (e-ΔΔΔΦ)

Οδηγός Χρήσης του e-ΔΔΔΦ (Ηλεκτρονικό Εργαλείο PNDP σε Google Sheets) • Έκδοση: Φλεβάρης 2026 Σκοπός Το e-ΔΔΔΦ είναι ένα ηλεκτρονικό πρότυπο τεκμηρίωσης που μεταφράζει τη λογική του PNDP σε δομημένη ροή εργασίας μέσα σε περιβάλλον Google Sheets. Στόχος του είναι να υποστηρίζει συστηματική καταγραφή εκτίμησης, διάγνωσης, παρέμβασης και παρακολούθησης/αξιολόγησης, με μειωμένη εξάρτηση από ελεύθερο κείμενο και με δυνατότητα παραγωγής συνοπτικής αναφοράς. Πρόσβαση και αρχική ρύθμιση Ανοίξτε το αρχείο e-ΔΔΔΦ στο Google Sheets. Αν σας ζητηθεί, επιλέξτε «Αρχείο > Δημιουργία αντιγράφου» ώστε να εργάζεστε σε δικό σας αντίγραφο. Αν εμφανιστεί προειδοποίηση για σενάρια (Apps Script), επιτρέψτε τα απαραίτητα δικαιώματα για να λειτουργήσουν τα προσαρμοσμένα μενού/εντολές.

ΔΙΑΔΙΚΑΣΙΑ ΔΙΑΤΡΟΦΙΚΗΣ ΚΑΙ ΔΙΑΙΤΟΛΟΓΙΚΗΣ ΦΡΟΝΤΙΔΑΣ

Από την Ελίνα Πολυδώρου και επιβλέπων καθηγήτρια Ελένη Ανδρέου
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Μέρος της διδακτώρική διατριβής με τίτλο:

Comparison of the Standardised Nutrition Terminology in a software or manual format and presentation of their impact to the Nutrition Care Process. An Observational cross-sectional study.

υπό την αιγίδα του Συνδέσμου Διαιτολόγων & Διατροφολόγων Κύπρου

Την πρώτη φορά που θα χρησιμοποιήσετε αυτό το εργαλείο, θα σας ζητηθεί να εξουσιοδοτήσετε πρόσβαση στον δημιουργό (elinapdr@gmail.com). Ο δημιουργός δεν μπορεί να δει, διαβάσει ή επεξεργαστεί τις προσωπικές σας πληροφορίες. Η προσβαση απαιτείται αποκλειστικά για την λειτουργία των αυτόνομων δημιουργιών της περίληψης σε κάθε πεδίο, έπειτα από το πάτημα στα αντίστοιχα κουμπιά.

Δομή αρχείου και φύλλα εργασίας

Το αρχείο περιλαμβάνει τα ακόλουθα φύλλα (καρτέλες), με ακριβή ονόματα:

Εξώφυλλο

«Ανθρωπομετρική και Βιοχημική Αξιολόγηση»

«Αξιολόγηση Ιατρικού Ιστορικού»

«Καταγραφή Φ.Α.»

«Διατροφική και Διαιτολογική Διάγνωση»

«Περίληψη ΔΔΔΦ)»

Φύλλο	Ρόλος/περιεχόμενο
Ανθρωπομετρική και Βιοχημική Αξιολόγηση	Χαρακτηριστικά Δικαιούχου, Σωματομετρικά δεδομένα και σχετικές μετρήσεις εκτίμησης.
Αξιολόγηση – Ιατρικό Ιστορικό	Ιατρικό ιστορικό, σχετικές διαγνώσεις/κωδικοποίηση και κλινικές πληροφορίες.

Καταγραφή Φαρμακευτικής Αγωγής (Φ.Α.)	Φαρμακευτική αγωγή και στοιχεία που συνδέονται με διατροφικές αλληλεπιδράσεις.
Διατροφική και Διαιτολογική Διάγνωση (ΔΔΝ)	Δομημένη διατύπωση διατροφικής/διαιτολογικής διάγνωσης (π.χ. λογική PAS).
Περίληψη Αξιολόγησης ΔΔΔΦ	Συγκεντρωτική προβολή/αναφορά με αντιγραφή-σύνθεση των επιμέρους πινάκων.

Προτεινόμενη ροή χρήσης

Η ακόλουθη ροή προτείνεται για την ολοκλήρωση μιας τεκμηριωμένης επίσκεψης/εκτίμησης:

Συμπληρώστε τα βασικά σωματομετρικά στοιχεία στο «Ανθρωπομετρική και Βιοχημική Αξιολόγηση»

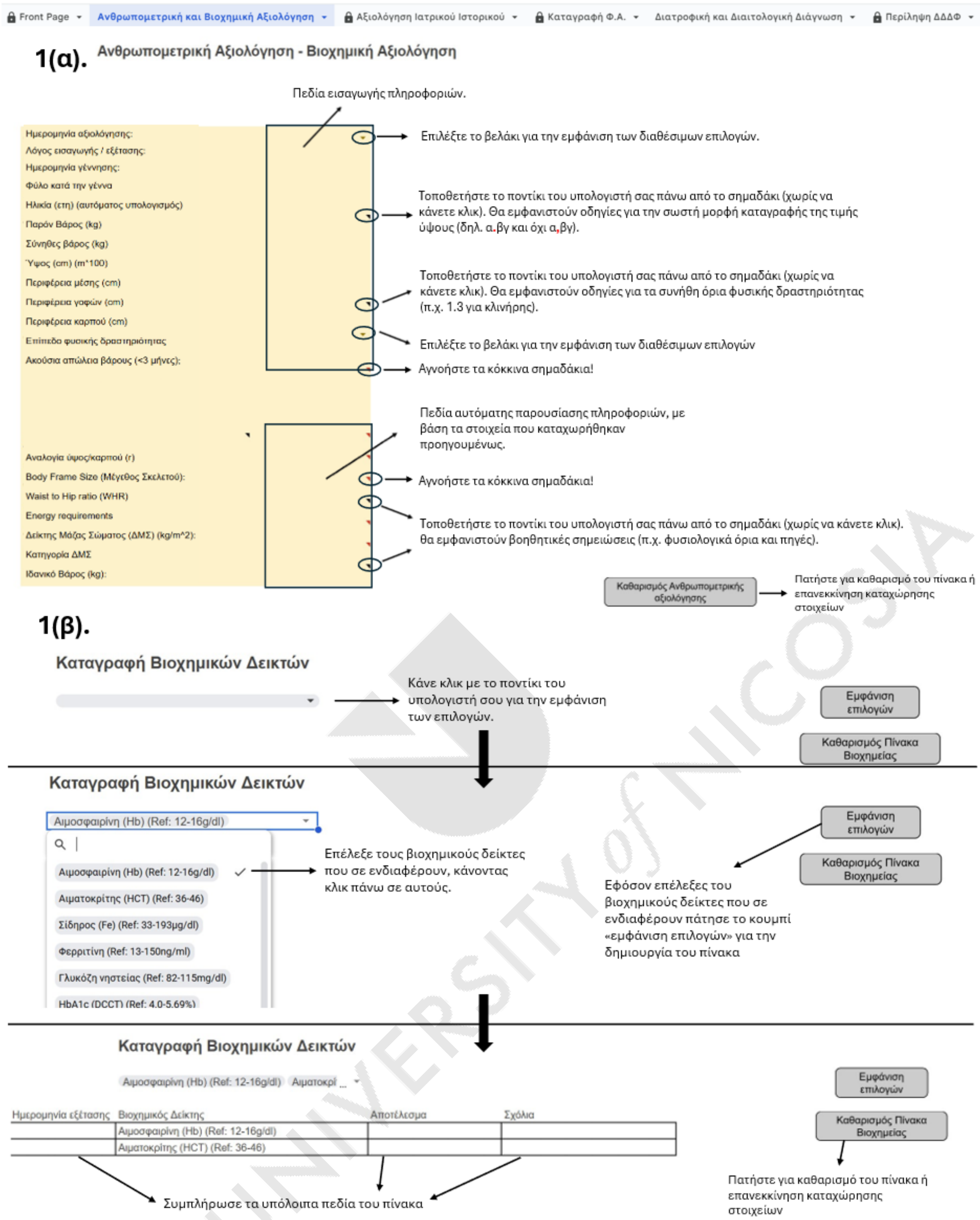
Ολοκληρώστε το κλινικό πλαίσιο στο «Αξιολόγηση Ιατρικού Ιστορικού».

Σημειώστε τα φάρμακα στο «Καταγραφή Φαρμακευτικής Αγωγής (Φ.Α.)» (και σχετικές παρατηρήσεις/αλληλεπιδράσεις όπου υπάρχουν).

Διατυπώστε τη διατροφική/διαιτολογική διάγνωση στο «Διατροφική και Διαιτολογική Διάγνωση (ΔΔΝ)».

Μεταβείτε στο «Περίληψη ΔΔΔΦ» για να συγκεντρώσετε τους πίνακες και να παράγετε αναφορά.

Στάδιο Ανθρωπομετρικής Αξιολόγησης και Αξιολόγηση Βιοχημικών Δεικτών



Στάδιο συλλογής Ιατρικού Ιστορικού

Front Page ▾ | Ανθρωπομετρική και Βιοχημική Αξιολόγηση ▾ | Αξιολόγηση Ιατρικού Ιστορικού ▾ | Καταγραφή Φ.Α. ▾ | Διατροφική και Διαιτολογική Διάγνωση ▾

2.

ΙΑΤΡΙΚΟ ΙΣΤΟΡΙΚΟ

Καθαρισμός | Δημιουργία Περίληψης στο τέλος της σελίδας

Πατήστε για καθαρισμό του πίνακα ή επανεκκίνηση καταχώρησης στοιχείων

δ. Εφόσον επέλεξες την διάγνωση/σεις που ισχύ κάντε κλικ σε οποιοδήπο σημείο στην οθόνη σας έπειτα πάτησε αυτό το κ

α. Επιλέξτε την ομάδα διάγνωσης (Υποχρεωτικό).

Επιλέξτε	Κωδικός Διάγνωσης	Περιγραφή Διάγνωσης	Λεπτομέρειες	Σχόλια
☐	C00-C97	Κακοήθη νεόπλασμα	▾	
☐	D00-D09	Νεόπλασμα in situ	▾	
☐	D10-D36	Καλοήθη νεόπλασμα		
☐	D37-D48	Νεόπλασμα με αβέβαιη ή άγνωστη συμπεριφορά	▾	
☐	D50-D53	Διατροφικές αναιμίες	▾	
☐	E00-E90	Ενδοκρινικές, διατροφικές και μεταβολικές παθήσεις	▾	
☐	F00-F99	Ψυχικές και συμπεριφορικές διαταραχές	▾	
☐	I00-I99	Παθήσεις του κυκλοφορικού συστήματος	▾	
☐	J00-J99	Παθήσεις του αναπνευστικού συστήματος		
☐	K00-K93	Παθήσεις του πεπτικού συστήματος	▾	
☐	L00-L99	Παθήσεις του δέρματος και υποδόριου ιστού	▾	
☐	M00-M99	Παθήσεις του μυοσκελετικού συστήματος και του συνδετικού ιστού	▾	
☐	N00-N99	Παθήσεις του ουρογεννητικού συστήματος	▾	
☐	O00-O99	Άλλες μητρικές διαταραχές που σχετίζονται κυρίως με την εγκυμοσύνη	▾	
☐	R00-R99	Συμπτώματα, σημεία και μη φυσιολογικά κλινικά και εργαστηριακά ευρήματα, που δεν ταξινομούνται αλλού	▾	
☐	T80-T88	Επιπλοκές χειρουργικής και ιατρικής περίθαλψης, που δεν ταξινομούνται αλλού	▾	
☐	Y40-Y84	Επιπλοκές ιατρικής και χειρουργικής φροντίδας	▾	
☐	Z00-Z99	Παράγοντες που επηρεάζουν την κατάσταση της υγείας και την επαφή με τις υπηρεσίες υγείας	▾	
☐	Z71.3	Διατροφική συμβουλευτική και επίβλεψη (Διατροφική συμβουλευτική και επίβλεψη)	▾	

β. Επιλέξτε το βελάκι για την εμφάνιση των διαθέσιμων επιλογών.

γ. Καταγράψτε σχόλια/σημειώσεις που σ ενδιαφέρουν ή για κάτι πο θέλετε να ανατρέξετε στο επόμενο ραντεβού.

Η Περίληψη θα δημιουργηθεί εδώ:

Στάδιο συλλογής Φαρμακευτικής Αγωγής

Front Page ▾ | Ανθρωπομετρική και Βιοχημική Αξιολόγηση ▾ | Αξιολόγηση Ιατρικού Ιστορικού ▾ | Καταγραφή Φ.Α. ▾ | Διατροφική και Διαιτολογική Διάγνωση ▾

3.

Πατήστε για καθαρισμό του πίνακα ή επανεκκίνηση καταχώρησης στοιχείων

β. Εφόσον επέλεξες το/τα φάρμακο/α που σε ενδιαφέρει/ουν, πάτησε αυτό το κουμπί για την δημιουργία του πίνακα στο τέλος της σελίδας.

Καταγραφή Φαρμακευτικής Αγωγής (Φ.Α.)

Καθαρισμός | Δημιουργία Περίληψης

Η Περίληψη θα δημιουργηθεί δεξιά στην κορυφή της σελίδας:

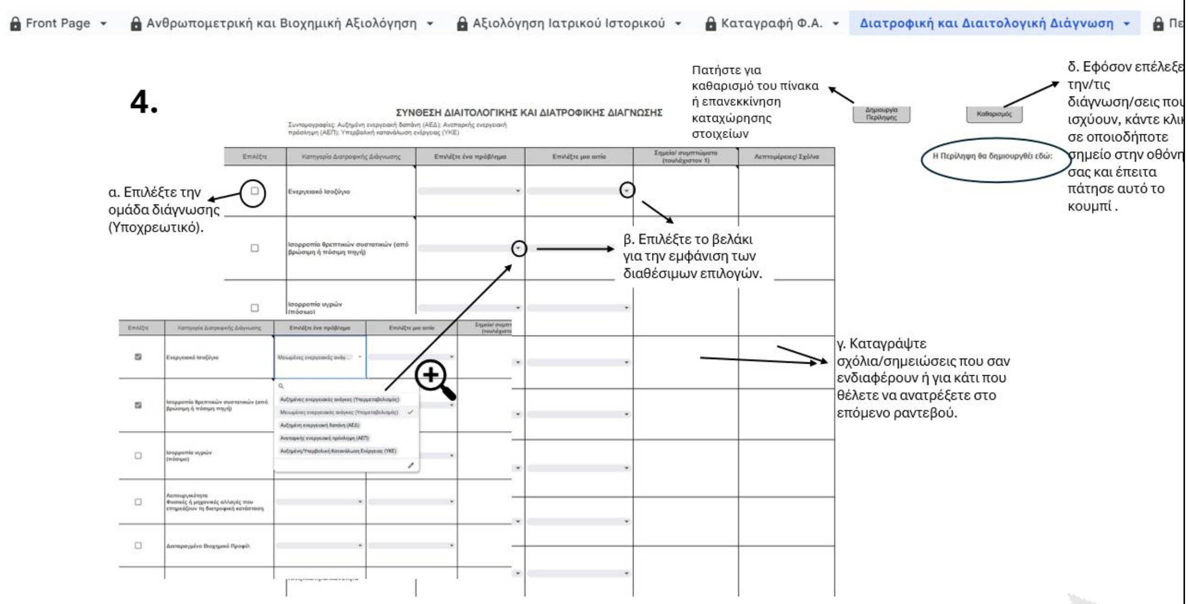
Αυτό το βελάκι στο πεδίο όπου δημιουργηθεί η

α. Επιλέξτε το/τα φάρμακο/α που σε ενδιαφέρει/ουν και έπειτα κάνε κλικ σε οποιοδήποτε σημείο της οθόνης σου.

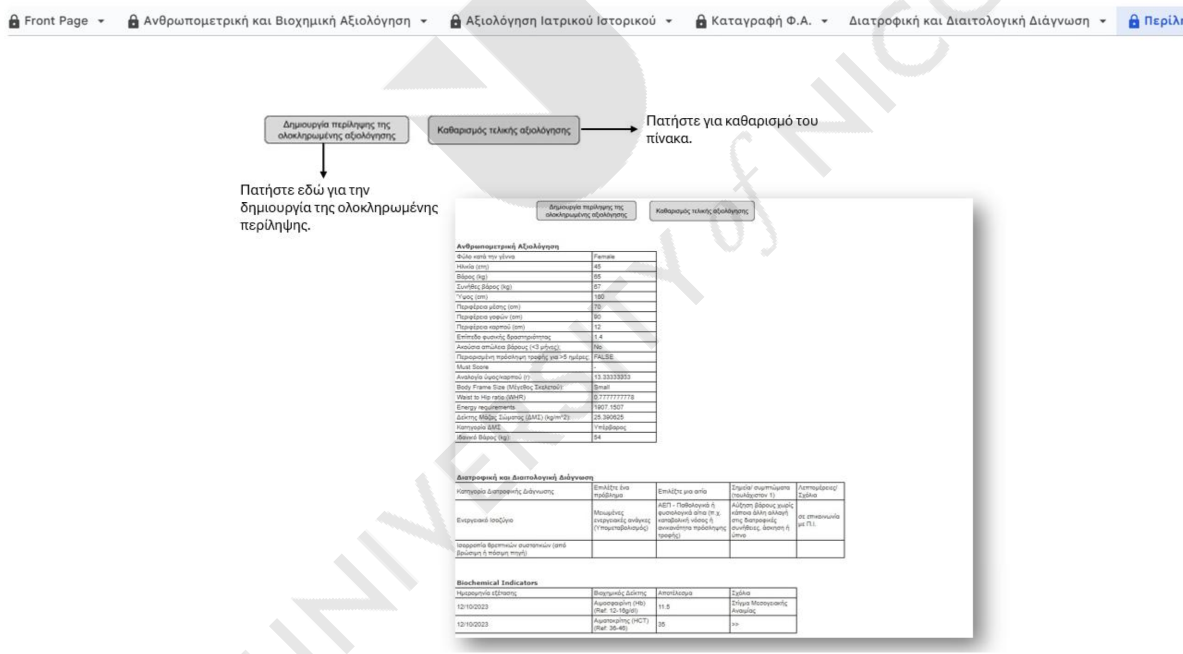
Επιλέξτε	Όνομα Φαρμάκου (Δραστική Ουσία)	Δράση	Αλληλεπίδραση με το φαγητό
☐	Abilify (aripiprazole)	Αντιψυχωτικό	Θα πρέπει να αποφεύγεται το αλκοόλ. θα πρέπει να καταναλώνονται πολλά υγρά. με ή χωρίς φαγητό.
☐	Acepril	Αντι-υπερτασικό	Να αποφεύγεται η γλυκόριζα, το πιπέρι cayenne. Να αποφεύγεται η υπερβολική κατανάλωση τροφίμων πλούσιων σε κάλιο (π.χ. μπανάνα, ντομάτα, αβοκάντο). Με ή χωρίς φαγητό.
☐	Acitretin	Για θεραπεία της σοβαρής ψωρίασης	Θα πρέπει να αποφεύγετε το αλκοόλ. με το φαγητό.
☐	Aflokan (mefenamic acid)	Για θεραπεία του ήπιου ή μέτριου πόνου (δεν πρέπει να χρησιμοποιείτε για χρόνο πέραν της 1 εβδομάδας)	Θα πρέπει να αποφεύγεται το αλκοόλ. να λαμβάνεται μαζί με το φαγητό.
☐	Akamon (benzatropine)	Αντιχολινεργικό	Θα πρέπει να αποφεύγεται το αλκοόλ. καλύτερα με το φαγητό.
☐	Alfuzosin (alfural , xatral, alpha-1 adrenergic antagonist)	Για την ασυμπτωματική καλοήθη υπερπλασία του προστάτη	Μετά από το ίδιο γεύμα της ημέρας καθημερινά. δεν πρέπει να λαμβάνεται με άδειο στομάχι.
☐	Allopron (allopurinol) xanthine oxidase inhibitor	Για την μείωση του ουρικού οξέος στα ούρα και τον ορό του αίματος	Θα πρέπει να αποφεύγεται το αλκοόλ. θα πρέπει να λαμβάνεται με 1φλ. νερό. μαζί με το φαγητό.
☐	Alphagan	Για την μείωση της ενδοφθάλμιας πίεσης και του γλαυκώματος	Να αποφεύγεται το αλκοόλ.
☐	Aluron (xanthine oxidase inhibitor)	Για την μείωση του ουρικού οξέος (gout) στα ούρα και στον ορό	Με το φαγητό. Με 1φλ. νερό. Να αποφεύγεται το αλκοόλ.
☐	Amaryl, nafuril (glimepiride is a sulfonylurea – can cause hypos)	Για την διαχείριση του διαβήτη	Θα πρέπει να αποφεύγεται το αλκοόλ. καλύτερα να λαμβάνεται μαζί με το φαγητό στο πρώτο γεύμα της ημέρας, εκτός κι αν ο γιατρός έχει δώσει διαφορετικές οδηγίες.
☐	Amicor, abator (atorvastatin)	Για την μείωση της χοληστερίνης	Θα πρέπει να αποφεύγεται το γκρέιπφρουτ και ο χυμός του. με ή χωρίς φαγητό.
☐	Amirol	Αγχολυτικό	Θα πρέπει να αποφεύγεται το αλκοόλ, η καφεΐνη και το βότανο st. john's wort. καλύτερα να λαμβάνεται με το φαγητό ώστε να μειώνεται ο ερεθισμός του στομάχου.
☐	Amirol (amitriptyline)	Αντικαταθλιπτικό	Θα πρέπει να αποφεύγεται το αλκοόλ. θα πρέπει να περιορίζεται η καφεΐνη. θα πρέπει να αποφεύγεται το st. john's wort. θα πρέπει να λαμβάνεται μαζί με το φαγητό για να αποφεύγεται ο ερεθισμός.
		Χρησιμοποιείται στη θεραπεία της οξείας και	

Η περίληψη σου θα δημιουργηθεί

Σύνθεση Διαιτολογικής και Διατροφικής Διάγνωσης



5. Δημιουργία Τελικής Περίληψης των στοιχείων που έχουν καταχωρηθεί



Σύνοψη και αναφορά στο «Summary of Assessment»

Το φύλλο «Περίληψη ΔΔΔΦ» χρησιμοποιείται για να συγκεντρώνει τους πίνακες/ενότητες σε μορφή αναφοράς. Ανάλογα με τη ρύθμιση του αρχείου, η αντιγραφή και μορφοποίηση μπορεί να γίνεται μέσω προσαρμοσμένων επιλογών μενού ή μέσω κουμπιών/εντολών που εκτελούν αυτοματισμούς (π.χ. αντιγραφή πινάκων, καθαρισμός ενοτήτων, κλείσιμο μεγάλων κενών). Μετά την αντιγραφή των πινάκων, αποθηκεύστε ή εξάγετε την αναφορά (π.χ. Αρχείο > Λήψη > PDF) όταν ολοκληρωθεί η τεκμηρίωση.

Καθαρισμός και επαναχρησιμοποίηση

Για επαναχρησιμοποίηση του προτύπου σε νέο περιστατικό, συνιστάται η δημιουργία καινούργιου αντιγράφου (π.χ. Αρχείο > Δημιουργία αντιγράφου) ή εκκαθάριση των πεδίων εισαγωγής και της σύνοψης. Αν το αρχείο περιλαμβάνει εντολές εκκαθάρισης ανά ενότητα ή συνολικά, χρησιμοποιήστε τις ώστε να αποφεύγεται υπολειμματική πληροφορία από προηγούμενο περιστατικό.

Συχνά προβλήματα

Δεν λειτουργούν τα προσαρμοσμένα μενού/εντολές: ελέγξτε ότι έχετε αποδεχθεί τα απαιτούμενα δικαιώματα (Apps Script) και ανανεώστε τη σελίδα.

Δεν ενημερώνεται η σύνοψη: βεβαιωθείτε ότι οι ενότητες έχουν συμπληρωθεί και ότι εκτελείται η εντολή αντιγραφής/συγκέντρωσης.

Αλλαγές μορφοποίησης: αποφύγετε την απευθείας επεξεργασία δομικών κελιών/τύπων, εκτός αν γνωρίζετε τη λειτουργία τους.

CHAPTER 5 DISCUSSION

5.0 Introduction

The chapter is organised around interpretation of key findings, comparison with the literature, implications for practice and policy, strengths and limitations, recommendations for future research, and a chapter summary.

Chapter 4 presented the quantitative and qualitative findings on current documentation practices, perceptions of standardised language and the usability of electronic formats within the Cypriot context. Those findings are discussed here in relation to the research objectives and existing literature.

The study had two linked purposes: first, to examine current documentation practices and perceptions relating to structured documentation among nutrition and dietetic professionals in Cyprus, with particular focus on PNDP; and second, to develop and evaluate, through expert validation, a context-specific electronic PNDP tool informed by those findings. For the electronic tool to be relevant to practice, it needed to be tailored to the needs of the NDPs, as identified through the online questionnaire.

The questionnaire helped to establish the level of awareness and understanding of the NDPs in Cyprus regarding the different DPs and SLs. Trends regarding their use and perceptions of related benefits or drawbacks were also assessed to aid the development of the electronic tool. Other parameters that could further strengthen or weaken such perceptions were also assessed, for example the geographic location or the practice setting of the NDPs, or the years of experience and prior exposure to such frameworks. Opinions related to future implementation strategies of a DP or a SL at a national level and the implications of their use were also collected.

5.1 Overview of Key Findings

The study examined current documentation practices related to structured documentation in Cyprus, with particular focus on PNDP, and explored the perceived value and practical acceptability of an electronic PNDP tool through development and expert validation. Overall, the findings suggest that awareness and conceptual endorsement of structured documentation are relatively widespread among nutrition and dietetic professionals in Cyprus, but consistency of implementation remains variable across practice contexts.

Participants recognised the professional and clinical value of structured documentation and standardised language, particularly for communication, consistency, and clearer record keeping, while also identifying practical barriers such as time burden, training needs, workflow disruption, and limited digital support. Considered alongside the expert validation findings and the wider international literature, the results further suggest that electronically structured PNDP formats may support documentation clarity, practical usability, and the transparency of clinical reasoning. Taken together, these findings indicate that effective implementation depends not only on conceptual agreement with structured frameworks, but also on workflow compatibility, practitioner training, organisational support, and the availability of supportive digital tools within evolving healthcare systems.

5.2 Interpretation in Relation to Existing Literature

The present findings align with and extend existing international evidence regarding implementation of structured nutrition documentation frameworks. Consistent with multinational studies (Lovestam et al., 2017; Lovestam, Steiber et al., 2019; Vinci et al., 2023), this study demonstrates that while awareness of structured documentation processes is relatively high, consistent operational implementation varies considerably across practice settings. Similar to previous research, practical barriers—including time constraints, workflow integration challenges, and technological limitations—emerged as influential determinants of adoption.

The positive expert evaluation of the electronic PNDP tool, considered alongside earlier findings reported by O'Sullivan (2013) and related international evidence, is consistent with the view that digitally structured documentation formats may support usability, clarity, and implementation feasibility. Specifically, O'Sullivan (2013) demonstrated that electronic prototypes integrating structured diagnostic prompts enhanced practitioner confidence and facilitated stepwise reasoning. Likewise, multinational analyses have shown that electronic health record (EHR) integration is associated with stronger implementation rates and improved documentation clarity (Lövestam, E. et al., 2020). The current findings reinforce this pattern within a smaller and digitally evolving health system, suggesting that digital integration may exert a consistent influence across diverse healthcare contexts.

However, the present study advances the literature by explicitly conceptualising documentation format as a determinant of implementation experience. Whereas prior studies frequently treated electronic infrastructure as a contextual facilitator, the findings here suggest that format may shape diagnostic clarity, perceived efficiency, and sustainability of structured documentation. This supports the argument raised in Chapter 2 that documentation medium should be examined not merely as infrastructure, but as an active component influencing clinical reasoning processes.

In relation to structured language use, the reported improvements in diagnostic confidence among participants using PNDP electronically align with evidence suggesting that standardised terminology strengthens clarity and interdisciplinary communication (Vinci et al., 2023; Swan et al., 2017). The structured prompts embedded in the electronic tool were judged by experts as likely to reduce ambiguity in PES formulation, echoing previous findings that usability-enhancing features—such as predefined diagnostic structures—improve consistency of documentation (Lövestam et al., 2017). At the same time, variability in reported training exposure reflects international observations that structured frameworks require formal education and reinforcement to ensure effective integration (Lövestam, Steiber et al., 2019).

The partial support for H1—indicating that current assessment practices do not uniformly ensure consistent, high-quality documentation—also resonates with prior evidence highlighting discrepancies between conceptual endorsement of the NCP and practical application. Studies in South Korea and Saudi Arabia, for example, have reported continued reliance on manual documentation despite recognition of structured framework benefits (Kim & Baek, 2013; Vinci et al., 2023). The present findings suggest that similar variability exists in Cyprus, particularly where digital templates are not embedded within the national EHR system.

From an implementation science perspective, the moderating role of training and digital infrastructure observed in this study supports existing literature emphasising organisational and technological readiness as critical adoption factors (O'Sullivan, 2013). Consistent with diffusion of innovation principles, electronic PNDP integration appears more sustainable when supported by structured training, leadership endorsement, and workflow alignment. This reinforces the notion that adoption is not solely an individual-level decision but a system-level process shaped by institutional context.

Importantly, the expert validation findings contribute novel evidence to a literature that has been dominated by cross-sectional self-report studies. Few prior investigations have involved the empirical development and evaluation of context-specific digital PNDP tools. The positive usability ratings and constructive thematic feedback in this study therefore extend beyond descriptive adoption research and provide applied insight into tool feasibility within a nationally regulated yet digitally maturing healthcare system.

Overall, the findings both corroborate and extend existing literature. They confirm the recognised benefits of structured digital documentation while advancing understanding of documentation format as a meaningful implementation variable. By situating these findings within the Cypriot healthcare context, this study contributes context-sensitive evidence to an international body of research that has largely focused on larger or more digitally mature health systems.

5.3 Conceptual Contribution: The Potential Role of Digital Format in Supporting Structured PNDP Implementation

A central conceptual contribution of this study lies in highlighting the potential importance of digital documentation format as a support for structured PNDP implementation. While the present study did not directly compare manual and electronic documentation formats empirically, the combined survey findings, expert validation results, and international literature suggest that digital structure may influence how consistently structured documentation is operationalised in practice. These interpretations should be understood as conceptually and contextually supported rather than as direct evidence of comparative effectiveness, since the study did not involve real-world comparative testing of manual and electronic formats. Existing literature has frequently identified electronic health record (EHR) integration as a facilitator of NCP/PNDP adoption; however, format has typically been treated as a background condition rather than as a determinant shaping professional reasoning and behavioural adherence. The present findings suggest that documentation medium may influence how structured frameworks are operationalised in practice. The expert validation findings, considered alongside international literature, suggest that electronically structured formats may support clearer formulation of nutrition diagnoses, stronger linkage between assessment findings and interventions, and greater confidence in structured documentation. This indicates that digital format may reduce cognitive load by embedding structured prompts and predefined diagnostic logic within the documentation process. In contrast, manual documentation requires the practitioner to internally generate and structure the PNDP logic without system-level scaffolding. As a result, implementation fidelity may vary more substantially in manual formats, even when conceptual understanding of PNDP is present.

The findings therefore support conceptualising documentation format as a mediator between professional knowledge and implementation behaviour. While training and awareness are necessary, they may not be sufficient to ensure consistent adoption in the absence of digital structural support. Electronic templates that incorporate structured language and diagnostic pathways appear to externalise the logic of clinical reasoning, making it more transparent, reproducible, and auditable.

From an implementation science perspective, this reframing aligns with the view that technological artefacts are not neutral tools but shape professional practice patterns. Documentation systems can either constrain or enable structured reasoning depending on their design. Rather than empirically demonstrating direct differences between manual and electronic formats, the present study provides context-specific evidence that supports the potential value of digital structure as an implementation support.

In doing so, the research extends beyond descriptive adoption studies and contributes a conceptual lens through which documentation systems may be evaluated. Documentation format emerges as a structural determinant of implementation sustainability, professional visibility, and standardisation fidelity. This contribution has implications not only for dietetics, but also for other health professions seeking to embed structured care pathways within digital environments.

5.4 Implications for Policy and Practice in Cyprus

The findings of this study have practical implications for clinical documentation, professional training, and health system development within Cyprus. At practice level, the variability observed in documentation format, completeness, and use of structured language indicates that PNDP is recognised and used, but not yet implemented in a fully consistent manner across settings. This suggests that standardisation cannot rely on professional awareness alone. In the absence of embedded digital structure, implementation remains dependent on individual routines, training exposure, and local workflow conditions. A structured electronic PNDP format could therefore help reduce variation in note structure, improve documentation consistency, and support clearer linkage between assessment, diagnosis, intervention, and monitoring.

Within the Cypriot health system, these implications are particularly relevant because documentation expectations already exist, yet structured digital support remains limited. The findings suggest that the current gap is not between professional regulation and absence of documentation, but between documentation requirements and the practical tools available to support standardised completion. Integration of a validated, context-adapted electronic PNDP template within the GHS platform could strengthen auditability, continuity of care, and comparability of records across practitioners. This would be especially valuable in a system where quality-linked governance is developing and where structured, retrievable documentation is necessary for monitoring practice and service performance.

The findings also indicate that implementation is likely to depend on training and workflow fit as much as on policy endorsement. Reported barriers in the present study, particularly time burden, training needs, and workflow disruption, suggest that digital integration alone would be insufficient without parallel educational and organisational support. For this reason, undergraduate education, clinical placement training, and continuing professional development should incorporate structured documentation and practical PNDP use more explicitly. Training should focus not only on introducing the framework in principle, but also on the stages that participants found most challenging in practice, particularly nutrition diagnosis and intervention, and on the use of digital tools that support structured completion.

At policy level, the findings support phased rather than immediate large-scale implementation. The expert validation findings indicate that the electronic PNDP tool is feasible and acceptable in principle, but real-world integration should first be evaluated through pilot use in selected settings. Pilot implementation would allow assessment of workflow compatibility, documentation quality, usability under routine conditions, and any additional refinement needs before wider adoption. Such a staged approach would also allow alignment with existing GHS documentation requirements and emerging quality-of-care initiatives.

A further implication concerns professional visibility. When dietetic documentation is structured, legible, and integrated within shared records, nutrition diagnoses and interventions become easier to identify, review, and communicate within multidisciplinary care. This has implications not only for continuity and quality of care, but also for how the contribution of dietitians is recognised within the wider health system. In this sense, standardised digital documentation should be understood not only as a technical improvement, but also as a mechanism for strengthening accountability, interdisciplinary communication, and the measurable visibility of dietetic practice.

Overall, the findings suggest that Cyprus is at a point where policy, professional standards, and digital development could be more closely aligned. A structured electronic PNDP tool, supported by training, phased implementation, and appropriate governance mechanisms, may offer a practical route towards greater consistency, transparency, and quality in nutrition documentation within the national healthcare system.

5.5 Current Nutrition Assessment and Documentation Practices

5.5.1 Current documentation methods

Documentation in Cyprus appears mixed. Almost all participants were aware of a DP (98.4%), but documentation methods differed across individuals and settings. PNDP was the most used DP (68.3%), while fewer reported using SOAP (11.1%) or NCP (6.3%). A minority reported awareness without use (12.7%). This suggests structured documentation exists, but it is not a shared standard in all settings.

Implementation also varied. Most DP users reported using all stages (73%), but partial use was reported (17.5%). Among PNDP users, most reported full implementation (70.2%), but some steps were omitted, including Step 6 (Evaluation). This indicates that while structure is valued, completion depends on workflow and context.

5.5.2 Use or absence of PNDP and NCP

The high use of PNDP likely reflects training exposure and use during clinical placement. PNDP was the most frequently reported standardised language used during placement (52.4%), but many reported no SL use during placement (22.2%). This suggests PNDP uptake may depend on whether placements and supervisors supported structured documentation.

In contrast, NCP use was low, with most participants reporting non-use. This aligns with evidence that NCP adoption depends on training, time, and system support (Lovestam, Vivanti et al., 2019; Vinci et al., 2023). It is also consistent with findings that Greece showed lower awareness and uptake than other countries (Lovestam, Steiber et al., 2019), which may be relevant given similarities in implementation capacity and system supports.

5.5.3 Variability in practice

Variability was evident at three levels. First, some participants did not use a DP despite being aware of one. Eight reported non-use, consistent across questions. Awareness alone did not translate into routine use. Second, use varied in completeness. Partial implementation and step omissions occurred across DPs. PNDP users most often identified Nutrition Diagnosis and Nutrition Intervention as the most difficult steps. Open-ended responses supported this: the most common difficulty was that PNDP is time-consuming, followed by difficulty writing the nutrition diagnosis and lack of required information to complete the process. These match international findings that time constraints and insufficient training are common barriers (Kim & Baek, 2013; Lövestam, E. et al., 2020; Vivanti et al., 2018).

Third, participants differed in when they considered structured documentation necessary. Those using a DP only in selected cases linked DP use to patient complexity (e.g. chronic illness, medication use, abnormal lab values, renal disease, GHS visits). This suggests a case-based approach where DPs are used when risk and complexity are higher.

5.5.4 Why these patterns exist in the Cypriot context

Several contextual factors help explain these patterns. One factor is documentation infrastructure. There are no validated electronic PNDP tools in Cyprus. Documentation within the GHS electronic platform relies mainly on free text without built-in structure. In practice, structure depends on each NDP rather than system design.

A second factor is uneven access to patient information within the GHS platform. Clinical dietitians have limited access and capabilities compared with other professionals. This makes full documentation harder, especially for steps that depend on monitoring, follow-up, and lab data.

A third factor is how audit is currently applied. Audit measures emphasise financial and regulatory compliance, while quality-of-care data are not systematically collected. This reduces external pressure to standardise documentation, and gaps are more likely when workload is high and structured documentation is not required (Theodorou et al., 2025).

National requirements also shape documentation in specific areas. Anthropometric measurements are mandatory in GHS guidance, and PNDP is included in approval processes for visit extensions. This may encourage PNDP use in cases linked to GHS pathways, without leading to consistent use across all settings.

5.5.5 Links to system constraints, training exposure, and professional culture

The barriers reported by participants align with system constraints. Time burden was the most frequently reported drawback of standardised language and structured processes, and PNDP was commonly described as time-consuming. This matches international evidence that time remains a major barrier even when knowledge improves (O'Sullivan et al., 2019; Vivanti et al., 2018). It also aligns with findings that structured electronic templates can improve feasibility (Lovestam et al., 2017; O'Sullivan, 2013). In Cyprus, where documentation is often free text, the workload of structured documentation falls mainly on the practitioner.

Training exposure also appears uneven. Academic seminars and clinical placement were common sources of DP awareness, but not all placements used standardised language. This fits evidence that implementation depends on local reinforcement and tools that support routine use (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vinci et al., 2023).

Professional context may also matter, particularly given the high proportion of participants in private practice and in settings without other healthcare professionals. In these settings, documentation may be driven more by individual routine than by shared organisational requirements. This may explain why participants reported benefits of standardised language for structure and communication, while also reporting barriers such as time burden, training needs, and workflow disruption.

Overall, the findings suggest that PNDP is widely known and used in Cyprus, but consistent and complete implementation is limited by time, uneven training exposure, and limited digital support. The variation observed is consistent with a system where documentation frameworks exist, but practical supports for routine use are not yet in place.

5.6 Impact of Manual vs Software-Based Standardised Terminology

The findings of the present study, considered alongside the international evidence reviewed in Chapter 2, suggest that documentation environment may influence how easily dietitians apply

PNDP/NCP logic in routine practice and how consistently standardised terminology is expressed in written records. In this sense, the impact of standardised terminology depends not only on whether a framework is endorsed, but on whether the documentation environment supports structured reasoning, clear expression of decisions, and efficient use of agreed terms.

5.6.1 Potential Role of Digital Formats in Supporting Structured PNDP and Standardised Terminology

Manual documentation (paper-based notes or unstructured free-text entry) remains common across contexts and may be perceived as familiar, flexible, and quick for some practitioners. However, the evidence synthesised in Chapter 2 suggests that manual formats are more likely to produce variability in structure and terminology, particularly when standardised language must be generated without embedded prompts. Handwritten or manual NCP documentation has frequently been described as inconsistent and time-consuming, with documentation quality more dependent on individual writing style and personal habits than on an agreed structure.

This is particularly relevant for the nutrition diagnosis step. Standardised frameworks require clinicians to articulate the nutrition problem using structured statements (e.g. PAS). International literature consistently reports that dietitians find it challenging to select appropriate diagnostic terms and to formulate coherent diagnosis statements, even when they perceive the framework as professionally valuable. This helps explain why clinicians may adopt the broader process more readily than the full terminology set, and why uptake often varies by step, with diagnosis being a frequent point of difficulty and inconsistency (Lovestam, Vivanti et al., 2019; Vinci et al., 2023).

In the present study, a similar gap between conceptual endorsement and applied performance was observed. Although almost all participants agreed that nutrition diagnosis is distinct from medical diagnosis (98.4%), only approximately half correctly identified a nutrition diagnosis from a list (52.4%). While this item does not directly assess documentation output, it supports the interpretation that diagnosis-related competence and terminology application may be inconsistent in practice, particularly where documentation systems do not actively support standardised phrasing and structure.

5.6.2 Software-based formats as enablers of structured PNDP/NCP recording

In contrast, software-based documentation environments can embed the PNDP/NCP structure into the documentation process itself. Evidence reviewed in Chapter 2 indicates that electronic health records (EHRs) capable of accommodating structured NCP documentation—particularly through templates, guided fields, and drop-down options for terminology—are associated with improved feasibility of implementation, clearer documentation, and greater consistency across practitioners (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vinci et al., 2023).

A clear example is the electronic NCP/NCPT prototype evaluated by O'Sullivan (2013). The prototype incorporated structured menus and ready-to-select diagnostic and intervention options. Participants consistently preferred the electronic terminology format over paper due to ease of use, retrospective accessibility, integration with EHR systems, and improved time efficiency. Confidence increased following prototype use, and the step-by-step structure was reported to support critical thinking during documentation. The findings illustrate how electronic formats can make documentation more standardised by encouraging use of predefined terms and by guiding users through the process steps.

The electronic PNDP tool developed in the present study is aligned with this approach, while differing in important practical characteristics. The PNDP tool was created as a web-based Google Sheets template in Greek, rather than an installable software system in English, and it is modelled directly on PNDP rather than NCP. Unlike O'Sullivan's prototype, it can be adapted across patient groups and can store notes in repeated use. However, because it is not embedded within a national EHR, each use requires appropriate storage and labelling in accordance with GDPR and local data protection procedures, which has implications for implementation feasibility and record governance.

5.6.3 Effects on documentation quality, clarity, and consistency

Across the evidence base, electronic formats are commonly associated with improved documentation quality due to better structure, legibility, and completeness. In dietetic contexts, the ability of an EHR to accommodate NCP documentation (including templates and drop-down lists for PAS components) is repeatedly described as a facilitator of routine uptake and consistent record keeping (Lovestam et al., 2017). In multinational work, EHR availability emerges as a prominent enabler of NCP implementation, alongside peer support and national association recommendation (Lovestam, Vivanti et al., 2019). Similar findings from adjacent professions (e.g. nursing) indicate that structured electronic templates improve completeness, clarity, and care planning quality compared with paper-based records.

Applied to PNDP/NCP logic, these effects are particularly relevant for:

- Clarity: Structured fields support clearer expression of assessment findings and decisions, reducing ambiguity in written records.
- Consistency: Drop-down terminology and preformatted diagnosis structures reduce variation in wording, supporting comparability across clinicians and settings.

- Transparency and auditability: When the same structure is applied consistently (assessment, diagnosis, intervention, monitoring/evaluation), it becomes easier to review the rationale for decisions and to evaluate implementation quality.

The emphasis on ready-to-use labels and structured diagnosis statements in electronic formats is therefore not an administrative feature. It directly supports more standardised documentation, which strengthens continuity of care and interpretability of dietetic records.

5.6.4 Effects on efficiency and the persistent role of time as a barrier

Despite the benefits of structure and clarity, time remains a consistent barrier across the international literature. Large multinational studies identify lack of time as the strongest reported barrier to NCP implementation, followed by inadequate training and knowledge (Lovestam, Vivanti et al., 2019). Longitudinal evidence shows that even when knowledge and confidence improve over time, the perception of NCP/NCPT as time-consuming may persist (Vivanti et al., 2018). This suggests that training alone may be insufficient to change time perceptions if documentation systems remain poorly aligned with workflow.

Electronic formats can address efficiency by reducing barriers at documentation points commonly experienced as difficult or time-intensive, particularly nutrition diagnosis articulation and the generation of structured summaries that link assessment findings to interventions and monitoring plans. Both O'Sullivan's prototype and the present electronic PNDP format reflect this principle through structured menus and pre-defined diagnostic elements, aiming to improve time efficiency by making standardised phrasing and terminology selection easier to implement in routine practice.

5.6.5 How format influences behaviour in practice

Documentation format also shapes practice behaviour by influencing how consistently dietitians follow the PNDP/NCP sequence and how readily terminology is used in a standardised way. Key mechanisms include: (a) structured sequencing reinforces the PNDP/NCP pathway. Templates and guided sections support consistent completion of each step and promote clearer linkage between assessment evidence and resulting decisions; (b) predefined terminology supports consistent expression of diagnoses and plans. Drop-down lists and ready-to-use diagnostic labels encourage use of agreed terms, reducing variation due to individual phrasing; (c) step-by-step structure supports structured critical thinking during documentation. By guiding users through each phase, electronic formats can support consistent decision articulation, particularly at the diagnosis stage where justification and clarity are essential.

Overall, the literature and the present findings support the interpretation that software-based approaches do more than convert paper records into electronic text. When designed around PNDP/NCP logic and terminology, they can promote clearer, more consistent, and more transparent documentation. Manual formats may preserve flexibility, but they also increase variability in structure and terminology use, particularly in areas such as nutrition diagnosis where standardised expression is essential and widely reported as challenging.

5.7 Dietitians' Perceptions of PNDP and Standardised Language

Among participants who reported using a documentation process only for selected cases, its use was mainly associated with patients with more complex medical profiles with or without urgent medical supervision. This suggests that NDPs may be more likely to use a structured and evidence-based process when patient care required more detailed clinical reasoning and planning.

5.7.1 Perceived usefulness and practical value

Participants' responses suggested that the perceived usefulness of standardised language and structured documentation is primarily linked to clearer communication and better record keeping. The most frequently reported benefit of standardised language was better communication among healthcare professionals, including clearer documentation and record keeping. This was followed by the view that standardised language enables structure and consistency. Participants also described potential benefits for patient care and outcomes, although these were reported less frequently than communication-related benefits.

This pattern suggests that standardisation is valued mainly because it makes documentation easier to understand and easier to follow over time, especially when more than one professional may be involved in care. This aligns with the purpose of PNDP and similar frameworks, which aim to improve transparency and consistency in documentation and in how nutrition care is described across settings (Lovestam et al., 2017; Vinci et al., 2023).

A smaller proportion of participants described standardised language as a professional tool for thinking or processing. Although less common, this theme is still important, because it indicates that some NDPs view structured documentation as a way to support decision making and planning, not only as a way to record decisions.

5.7.2 Professional value, visibility, and perceived recognition of dietetic contribution

Participants also associated standardised language with professional recognition. Most participants agreed that using a standardised language has changed or is expected to change how other healthcare professionals or NDPs perceive the value of dietetic contribution. Similarly, most participants agreed that using a standardised language could support the ability to audit care, support evidence-based practice, and improve quality of care and outcomes.

These findings indicate that standardisation is seen as a way to make dietetic work more visible and more clearly linked to evidence-based practice. At the same time, the relatively high proportion of uncertain responses suggests that, for some participants, the link between standardised documentation and measurable improvements in care is not fully clear in practice. This may reflect limited local experience of systems where dietetic documentation is routinely audited for quality or used to demonstrate outcomes, which is consistent with international evidence showing that perceived value is shaped by system infrastructure and the extent to which standardised documentation is supported and reinforced in routine workflow (Lovestam, Vivanti et al., 2019; Vinci et al., 2023).

5.7.3 Perceived complexity, time burden, and effort required

Despite recognition of benefits, participants frequently described implementation barriers. The most reported drawback of standardised language use was that it is time-intensive, followed by the need for prior training and education. Additional reported drawbacks included interference with workflow, difficulty translating thoughts into a different language, and concerns about misinterpretation by other healthcare professionals. A small proportion of participants reported concerns about unsafe practice.

This pattern is consistent with the international literature on NCP and NCPT implementation, where time constraints and limited training are repeatedly reported as major barriers (Kim & Baek, 2013; Lovestam et al., 2017; O'Sullivan, 2013; Porter, Jane M. et al., 2015). It also supports the interpretation that resistance often reflects feasibility challenges, rather than disagreement with the concept of standardisation.

5.7.4 Step-specific difficulty and confidence in framework use

Reported difficulty across PNDP steps helps clarify where participants experience the greatest challenges. Among PNDP users, most reported that none of the steps were difficult to implement. However, among those reporting difficulties, Nutrition Diagnosis and Nutrition Intervention were most often identified as the most difficult steps, while Monitoring and Evaluation and Assessment were less frequently identified.

This distribution is consistent with the type of work required at these stages. Diagnosis and intervention require the NDP to summarise and prioritise assessment findings, decide what the main nutrition problem is, and describe it clearly in a structured way. International evidence also identifies nutrition diagnosis formulation, including PAS style statement writing, as a common practical challenge and a reason for reduced confidence or slower documentation (Kim & Baek, 2013; Porter, Jane M. et al., 2015; Vivanti et al., 2018).

Age-related patterns also support an exposure and confidence explanation. A statistically significant association was observed between age group and reported PNDP implementation difficulties, with a moderate strength of association. Younger participants more frequently reported no difficulties, whereas older age groups included higher proportions reporting non-use or difficulties. This pattern is compatible with differences in recent training exposure and familiarity, similar to findings reported in international studies where implementation tends to be higher among those closer to graduation and decreases with years since qualification (Lovestam, Vivanti et al., 2019).

At the same time, familiarity does not remove the time burden. Even when participants reported that the framework is not difficult, time-intensive documentation was still the most common disadvantage. This suggests that being able to use the framework does not necessarily mean it feels efficient within everyday practice, particularly in settings with limited protected time or limited system support for structured documentation (Vinci et al., 2023; Vivanti et al., 2018).

5.7.5 Attitudes linked to adoption, selective use, and resistance

Overall, the findings suggest a pattern of qualified acceptance. Participants recognised key benefits, particularly communication, consistency, and professional value, but also described barriers that can discourage routine use. This combination supports selective implementation, where structured documentation is more likely to be used for complex cases, and less likely to be used consistently for all patients.

A smaller group of participants reported that a standardised method is not feasible or not necessary. These minority views remain important because they indicate that implementation strategies must address differences between practice settings and workflow realities, particularly in contexts where there is limited organisational reinforcement or limited digital support (Lovestam, Vivanti et al., 2019; Porter, J. M. et al., 2015).

Finally, the results also suggest a gap between broad agreement with key professional concepts and confidence in applying them in practice. For example, while almost all participants agreed that nutrition diagnosis is different from medical diagnosis, only around half correctly identified a nutrition diagnosis from a list. This pattern is consistent with the view that many NDPs understand the concept, but may still need practical support, training, and repeated use to apply diagnosis terminology accurately and confidently in real documentation (Kim & Baek, 2013; Porter, J. M. et al., 2015).

5.7.6 Professional identity and readiness

The higher uptake of DP use among younger or less experienced practitioners, together with lower reported difficulty, supports the interpretation that early exposure through education and placement practice contributes to readiness and confidence. This interpretation is consistent with evidence that structured frameworks and supervision can support transition into clinical practice and strengthen confidence in decision making (Hansen, 2021). It also aligns with work highlighting that early exposure to professional standards and applied training can strengthen commitment to professional competencies and ongoing development, including structured documentation practices (Cleary et al., 2024).

However, the persistence of time and complexity barriers indicates that motivation and identity alone are not enough for sustained adoption. International evidence suggests that uptake is more sustainable when training is paired with practical tools and workflow-compatible systems that reduce documentation effort, for example through templates and structured options within electronic records (Lovestam et al., 2017; O'Sullivan, 2013; Vinci et al., 2023).

In summary, participants perceived PNDP and standardised language as professionally valuable and clinically useful, particularly for improving communication, structure, and consistency in documentation. At the same time, adoption was limited by perceived time burden, the need for training, and workflow disruption, with Nutrition Diagnosis and Nutrition Intervention identified as the most challenging steps when difficulties were reported. These findings support the need for approaches that reduce documentation effort while supporting clear, consistent, and auditable recording of nutrition care, which provides a direct rationale for evaluating the usability and practicality of an electronic PNDP format in the next section.

5.8 Usability and Practicality of the Electronic PNDP Tool

The validation findings indicate that the prototype had strong content adequacy at the section level, with consistently high expert endorsement across relevance, clarity, and simplicity, and no section falling below commonly used acceptability thresholds for panels of this size (all I-CVI $\geq$ 0.86, exceeding the $\geq$ 0.78 criterion). The scale-level pattern with highest performance for clarity (S-CVI/Ave = 0.94; S-CVI/UA = 0.56), followed by relevance (S-CVI/Ave = 0.92; S-CVI/UA = 0.44), and then simplicity (S-CVI/Ave = 0.90; S-CVI/UA = 0.33), suggests that experts largely agreed the tool was understandable and appropriate for practice, while perceiving greater room for refinement in features linked to effort, navigation, or cognitive load (i.e. simplicity), even though ratings remained favourable overall. This interpretation is reinforced by the qualitative coding: among the comments provided, themes most frequently concerned interface/visual readability and workflow/functionality preferences, with fewer references to substantive gaps in content completeness. For example, experts requested the addition of a “search and find” function and the ability to enter additional laboratory values beyond those currently incorporated within the Biochemistry Assessment table. Notably, the observation that several recommendations referred to features already present within the prototype implies that part of the feedback may reflect discoverability and orientation limitations (brief exposure, screenshot-based review, or insufficient guidance) rather than true absence of functionality; this may also help explain why simplicity produced fewer universally agreed items despite high mean endorsement. In this context, the combined quantitative–qualitative profile supports a conclusion that the prototype is content-valid and broadly acceptable, with the remaining issues best characterised as fine-tuning needs (e.g. improving visual legibility, streamlining wording, strengthening navigation cues, and making existing functions more visible through clearer prompts or structured onboarding), rather than fundamental redesign or content removal.

5.8.1 Ease of use and perceived efficiency

Ease of use and perceived efficiency emerged as central conditions shaping whether structured documentation is applied routinely or selectively. In the main survey, participants who reported using a documentation process only for selected patients most commonly described case complexity (e.g., a complex medical profile with or without urgent medical supervision) as the trigger for applying a structured framework. This pattern suggests that practitioners perceive the value of PNDP-based documentation as situational: it becomes especially useful when a case requires clearer prioritisation, more explicit reasoning, and organised reporting, whereas in more straightforward encounters or when time pressure is high, the perceived “return” of completing every step may be lower. Importantly, this indicates that efficiency is not interpreted solely as speed, but as the extent to which a framework reduces cognitive burden, supports decision-making, and limits rework when the clinical situation is demanding.

The expert validation results reinforced this point by indicating that the electronic prototype was perceived as largely straightforward and workable at first contact, which is a key determinant of perceived efficiency in real settings. Overall, experts broadly agreed that the tool’s sections were appropriate for practice, understandable, and reasonably simple to follow, supporting the interpretation that the prototype’s structure and screen organisation were usable without extensive explanation. Where divergence in judgement appeared, it tended to be minor rather than shared concern, suggesting that perceived usability barriers were more likely to reflect small differences in how individuals weighed effort and navigation rather than fundamental problems with the tool’s content.

However, the relative pattern across the validation domains helps clarify where perceived efficiency may be most vulnerable. Compared with relevance and clarity, simplicity appeared to be the domain where experts more often indicated room for refinement, implying that effort-related perceptions (e.g., navigation steps, information density, and cognitive load) are the most likely factors to influence whether users experience the tool as time-saving in practice. This interpretation aligns with the qualitative findings: among the comments provided, themes most frequently concerned interface/visual readability and workflow/functionality preferences, which are directly linked to speed of use and task completion. Common suggestions included improving screenshot readability (e.g., larger images/fonts), minor editorial consistency, clearer wording in specific prompts, and inclusion of additional clinical fields (e.g., current weight and date entries). In several instances, experts proposed functions or fields that were already available in the prototype, indicating that perceived efficiency was shaped not only by what the tool contained but also by feature discoverability during brief, screenshot-based review. In effect, even a well-structured tool may be experienced as less efficient if key functions are not immediately visible or if users require additional guidance to locate them. Additionally, because the tool was self-developed by a clinical dietitian with non-specialist programming skills, its technical scalability and the extent of advanced automation or integration features were necessarily constrained by the developer’s skillset.

These findings align with broader implementation evidence indicating that time burden remains a persistent barrier even when knowledge and confidence improve. In Australian settings, perceived time demands continued despite increased familiarity with structured documentation approaches, and multinational survey evidence similarly identifies time as a dominant barrier alongside training gaps (Vivanti et al., 2018). In this study, the combined pattern suggests that the electronic format is viewed as appropriate and understandable, with perceived efficiency most likely to improve through refinements that reduce effort at the point of use, particularly readability, navigation cues, and visibility of existing features, rather than through major restructuring of content.

5.8.2 Workflow integration

Evidence from the literature suggests that workflow fit is one of the strongest drivers of routine use. In Sweden, NCP and terminology use became easier to sustain when electronic records were adapted to support structured entry, including drop-down options and preformatted diagnosis components (Lovestam et al., 2017). In those cases, usability improved when the system supported the work that dietitians already needed to do, rather than requiring them to create structure manually. The same pattern is visible in broader survey evidence. In the INIS study, availability of electronic health records was reported as an enabler of NCP uptake

(Lovestam, Vivanti et al., 2019). In the Swiss re-analysis, differences in access to electronic systems were associated with differences in implementation conditions, again highlighting that adoption depends on whether the system is practically available and usable in daily work (Vinci et al., 2023). These findings support the position that an electronic PNDP tool is more likely to be used when it aligns with existing documentation routines, rather than functioning as a separate and additional task.

The validation findings provide applied support for this interpretation by indicating that experts judged the structure of the prototype to be appropriate and understandable across the full documentation pathway, from the initial interface pages through to summary and output functions. In practical workflow terms, this matters because integration is not determined only by whether a tool contains the "right" content, but by whether users can move through it in a way that mirrors routine clinical work: collecting assessment data in a predictable sequence, translating that information into a structured diagnosis, and producing a usable record for follow-up or communication. The pattern of near-uniform endorsement across sections suggests that the tool's modular organisation (assessment sections, diagnosis section, summary/output components) was perceived as coherent and compatible with how dietitians typically document, which strengthens the argument that the prototype is positioned to support workflow integration rather than impose an additional parallel process.

At the same time, the qualitative results highlight the specific friction points that can disrupt integration even when content is judged adequate. Comments were most frequently coded under interface/visual readability and workflow/functionality preferences, which are precisely the domains that shape whether a tool can be used during consultations without slowing work. Requests such as improved readability (e.g., larger fonts/images), clearer wording in selected prompts, and the addition of common clinical fields (e.g., current weight and date entries) reflect integration concerns because these elements determine whether documentation can be completed efficiently at the point of care, or whether clinicians must rely on external notes and later transcription. In addition, suggestions for functions such as a "search and find" tool or the ability to enter additional laboratory values beyond those already included in the Biochemistry Assessment section indicate that experts were actively evaluating the prototype against real documentation demands, namely the need to retrieve information quickly and accommodate patient variability without interrupting the flow of the consultation.

A further workflow-relevant finding is that several expert recommendations referred to features already present within the prototype. This suggests that integration barriers are not always about missing functionality; they can also arise from discoverability problems, brief exposure, or insufficient orientation conditions that mirror real implementation settings where clinicians will abandon tools that require effort to "figure out" mid-work. In this sense, the validation feedback can be interpreted as an early indicator that successful workflow integration will depend not only on the tool's internal structure, but also on how clearly the interface signals available actions, and how effectively users are onboarded to the workflow logic (e.g., where key functions are located, how sections link, and how outputs are generated).

Taken together, the combined quantitative and qualitative profile supports that the prototype is aligned with routine documentation logic and therefore has promising conditions for integration, while also identifying practical refinements that would strengthen fit in live clinical workflows. Priorities emerging from the validation include improving visual legibility, reducing perceived information density where feasible, strengthening navigation cues, and making existing functions more visible through clearer prompts or brief guided instruction. These are workflow-level adjustments aimed at reducing interruption and supporting completion within routine practice, rather than indications that the PNDP structure or content requires major redesign.

5.8.3 Learning curve and training demands

The learning curve remains a key condition shaping whether an electronic PNDP tool is adopted and sustained in routine practice. Even when tools are judged to be valuable, implementation is weakened when training is limited or when practitioners feel unsure about applying the framework consistently. Lack of education and training was the strongest barrier reported in the electronic prototype study by O'Sullivan (2013) and training gaps were also repeatedly reported in wider implementation research (Kim & Baek, 2013; Lovestam, Vivanti et al., 2019; O'Sullivan et al., 2019). These findings suggest that usability includes not only interface design, but also how quickly users can learn the tool and feel confident using it. Importantly, the prototype by O'Sullivan (2013), also showed that structured electronic design can support learning through step by step menus and guided selection pathways, with participants reporting increased confidence after use. This supports the idea that the tool interface itself can reduce early uncertainty, especially when it provides a clear route through each PNDP stage.

The validation findings for e-ΔΔΔΦ offer direct insight into this "learning" dimension of usability. Quantitative appraisal indicated that experts generally considered the tool understandable and acceptable across its sections, which implies that the core structure is learnable and that the logic of the workflow can be grasped relatively quickly. At the same time, the qualitative results suggest that early learning may still be vulnerable to orientation issues, particularly in a prototype evaluated through brief exposure and screenshot-based review. Specifically, expert feedback most often clustered around interface/visual readability and workflow/functionality preferences, rather than fundamental problems with content adequacy.

These themes are closely tied to learning curve because they affect how easily a first-time user can interpret what they are seeing, locate key functions, and understand what the tool can and cannot do without additional explanation.

A particularly informative signal from the validation was that several recommendations concerned features or fields that were already present within the prototype. This pattern suggests that at least some feedback reflected limited discoverability and incomplete familiarisation, rather than genuine absence of functionality. In learning-curve terms, this indicates that the tool's "mental model" may not have been fully communicated through the screenshots alone: even if the workflow is logically structured, users may still require brief onboarding to understand navigation conventions, where specific functions are located, and how different sections interact (e.g., how entries flow into the Summary of Assessment or how optional elements can be accessed). Under these conditions, the validation may have captured not only judgements about usability in principle, but also a first-contact experience shaped by limited guidance, an experience that closely resembles real implementation scenarios where clinicians decide quickly whether a tool feels intuitive enough to persist with.

These findings reinforce the interpretation that the learning curve is not determined solely by conceptual clarity of PNDP content, but by the combined effect of visual legibility, prompt wording, and the visibility of key actions. Requests for clearer wording in selected prompts, minor editorial consistency, and addition of common clinical fields (e.g., "current weight" and date entries) can be understood as attempts to reduce uncertainty at the point of use, particularly for users who are still learning the structure and may rely on prompts as cognitive cues. Similarly, suggestions such as a "search and find" function or expanded laboratory-entry flexibility imply a desire to minimise the time spent figuring out how to handle non-standard cases, which is a common point at which novice users abandon structured tools and revert to free-text documentation.

Overall, the validation results support training demands. First, the tool appears sufficiently coherent to be learnable without extensive instruction, which is important for feasibility in time-pressured environments. Second, the qualitative profile indicates that adoption is likely to be strengthened by light-but-structured training supports such as a short, guided demonstration, clearer in-tool cues, or a brief user guide because early misunderstandings about existing functionality can translate into perceptions of inefficiency or missing features. In line with implementation literature, these results suggest that improving uptake may depend as much on how the tool is introduced (orientation and onboarding) as on the tool's underlying content and structure.

5.8.4 Structured menus, drop-down options, and guided reasoning

Structured menus, drop-down fields, and guided templates are repeatedly described as "active" implementation supports because they embed the logic of PNDP into the documentation task itself, rather than relying on clinicians to reconstruct the framework from memory at the point of care. In practice, these design elements help translate clinical reasoning into standardised, comparable entries by prompting users to document the same core components across cases and in a consistent sequence. Evidence from Sweden suggests that sustained use of NCP and terminology became easier when electronic records were adapted to support structured entry (including drop-down diagnosis components), because the system aligned documentation with routine workflow demands and reduced the need for manual formatting or repeated free-text structuring (Lovestam et al., 2017). Similarly, prototype evaluations have reported that ready-to-select diagnostic and intervention elements can increase preference for electronic formats over paper by improving accessibility and reducing documentation effort during real clinical encounters (O'Sullivan, 2013)

The validation findings for e-ΔΔΔΦ are consistent with this mechanism. Expert endorsement across the tool sections indicates that the prototype's modular structure, separating documentation into discrete PNDP-aligned components (e.g., assessment domains, diagnosis, and summary/output functions) was considered appropriate for practice and sufficiently understandable to support structured recording. This is important because "guided reasoning" depends on the perceived legitimacy of the prompts and pathways: when users judge the content and its phrasing as clinically appropriate, they are more likely to accept structured entry as a support to reasoning rather than a restriction. In addition, the qualitative coding shows that the most frequent suggestions clustered around interface/visual readability and workflow/functionality preferences, which are precisely the domains that determine whether structured options are experienced as efficient enablers (quick selection, clear prompts, predictable navigation) rather than as additional steps. Requests such as a "search and find" tool, or greater flexibility to enter laboratory values beyond those listed in the Biochemistry Assessment table, further illustrate a common real-world requirement: structured menus are most usable when they offer standardised options while still accommodating variation across patients and clinical settings.

Overall, the validation results support the interpretation that e-ΔΔΔΦ functions as more than a static documentation template: it operationalises PNDP by providing structured cues that shape how information is entered, how diagnoses are formulated, and how outputs are compiled into a coherent clinical note. From an implementation perspective, this is a key strength of electronic PNDP tools, structured interfaces can promote consistency and comparability without depending on lengthy narrative documentation, while the remaining refinements appear to relate mainly to optimising how users interact with these structured elements in routine practice (e.g., readability, navigation flow, and controlled flexibility for non-standard data).

5.8.5 Usability as a determinant of adoption

Taken together, findings support a clear interpretation. Adoption is more likely when usability is strong, meaning the tool is easy to use, fits the workflow, and feels efficient in practice. Adoption is less likely when usability barriers remain, especially limited training, perceived time cost, and disruption to routine processes (Lovestam, Vivanti et al., 2019; O'Sullivan et al., 2019; Vivanti et al., 2018). The expert validation ratings suggest that the electronic PNDP tool has a strong foundation in clarity and simplicity, which supports early acceptability. However, the wider evidence indicates that sustained use will still depend on how well the tool integrates into real documentation routines and whether users receive sufficient support to move from initial understanding to consistent application (Lovestam et al., 2017; O'Sullivan, 2013; Vinci et al., 2023).

5.9 Alignment with International Evidence

Overall, among the NDPs that implement a DP for selected patients, similar characteristics were described for those patients. Their main characteristic was a complex medical profile, with or without urgent medical supervision. This confirms that NDPs acknowledge the benefits of using a structured process of recording that is also evidence-based and aids in decision-making and planning a medical nutrition intervention, when caring for patients with complicated medical histories, even when they do not usually choose to use a DP for everyday clinical practice. This pattern suggests that structured documentation is perceived as particularly valuable when clinical reasoning, prioritisation, and follow-up demands are greater, such as inpatient settings or relevant clinical environments (Lovestam, Vivanti et al., 2019; Vinci et al., 2023). In the present findings, the same idea appears at the level of individual behaviour. Even when a DP is not used routinely, it becomes the preferred approach when care requires more detailed assessment, clearer prioritisation, and stronger follow-up structure. This supports the argument that the PNDP is viewed as a practical framework for managing higher documentation and monitoring requirements, rather than a routine administrative step.

The results also confirm two of the most consistent implementation barriers reported internationally, time constraints and training needs. In the open-ended drawbacks, the most frequent concerns were time-intensive processes and prior training and education required, followed by workflow interference and difficulty expressing nutrition diagnosis and PAS style statements. These mirror the international survey and case study literature, where time is repeatedly described as the strongest barrier and lack of training as a persistent limitation, even in settings with high awareness (Kim & Baek, 2013; Lovestam, Vivanti et al., 2019; O'Sullivan et al., 2019; Vivanti et al., 2018). The present findings add practical detail to these barriers in the Cypriot context by showing what "training need" looks like in practice. It is not only general unfamiliarity. It is also difficulty with the nutrition diagnosis step and the wording of the diagnosis statement, which is consistent with international findings that diagnosis is both highly used and frequently challenging, depending on exposure and system support (Kim & Baek, 2013; Vinci et al., 2023). In this respect, the Cyprus findings do not merely replicate international barriers, but specify how these barriers are expressed within local documentation practice.

A second clear point of alignment is the role of digital infrastructure. Internationally, stronger and more sustainable implementation is reported where electronic systems support structured documentation, such as templates and drop-down options for diagnosis statements (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019). In the present study, participants also selected introducing a standardised language in electronic health records as one of the most appropriate implementation strategies in clinical settings, and the wider results indicate that Cyprus currently lacks validated electronic PNDP tools. This matches the broader evidence that uptake is not only shaped by professional willingness but also by whether documentation tools fit everyday workflow (Lovestam et al., 2017; O'Sullivan et al., 2019). In this sense, the findings confirm the international conclusion that implementation becomes more realistic when structure is built into the tool, rather than added as extra work.

At the same time, the study extends the international literature into a new national context in two important ways. First, Cyprus shows high awareness of documentation processes and high use of PNDP in practice, but without the same level of system support described in countries where NCP and associated terminology have been embedded through national initiatives and electronic integration (Lovestam, Steiber et al., 2019; Vinci et al., 2023). Second, Cyprus has formal requirements linked to documentation within GHS workflows, including PNDP related documentation in specific approval processes, yet variation was still reported in what is treated as required or optional. This combination of formal expectations and uneven digital functionality creates a specific local implementation gap that is not well described in the international studies, which tend to focus either on countries where implementation has been established or on settings piloting electronic solutions (Lovestam et al., 2017; O'Sullivan, 2013). This is an important point of divergence, as it suggests that formal policy expectations do not necessarily translate into consistent structured practice when digital functionality remains limited.

Taken together, the findings support a consistent interpretation across chapters. International evidence shows that time, training, and electronic integration shape whether structured documentation becomes routine (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vivanti et al., 2018). The Cyprus results confirm the same barriers and enablers, while also indicating that PNDP is already widely recognised and used, even in the absence of validated electronic tools. This strengthens the rationale for developing and evaluating an electronic PNDP tool that supports structured completion in a practical format, especially for complex cases where NDPs already show a clear preference for using a framework-based approach.

5.9.1 Divergence from Previous Studies

Several findings diverged from patterns reported in international implementation studies and from what prior evidence would normally predict.

5.9.2 Differences from international trends

(a) High reported PNDP use despite limited digital infrastructure. In the present sample, PNDP was the most used documentation process, with 68.3% reporting use in clinical practice, and 72.6% reporting implementation for all patients. This pattern contrasts with international evidence where stronger implementation is repeatedly linked to electronic health record compatibility, including structured templates and drop-down options for standardised documentation (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vinci et al., 2023). In Cyprus, the current electronic platform allows note entry but lacks predefined PNDP structure and imposes restrictions in access and functionality for dietitians compared with other healthcare professionals, limiting integration and visibility of dietetic input within the system. This suggests that local uptake may be driven more by educational exposure and professional habit than by system-level digital support.

(b) Implementation in predominantly private and often isolated settings. International studies commonly report higher uptake in inpatient clinical environments and lower uptake in public health contexts (Lovestam et al., 2017; Vinci et al., 2023). In this sample, most participants reported working in private practice, often in settings without other healthcare professionals. High PNDP uptake under these conditions differs from the expectation that institutional infrastructure and interdisciplinary environments are the main drivers of routine standardised documentation.

(c) Lower alignment with professional communication trends. International work highlights national dietetic association recommendation as a major enabler of implementation (Lovestam, Steiber et al., 2019; Vinci et al., 2023). In the present findings, only 50.8% reported awareness of CyDNA recommendations, and awareness of the EFAD consultation was low (25.4%). This contrasts with settings where professional endorsement is both widely recognised and actively used as an implementation lever.

5.9.3 Differences from expectations based on previous evidence

(a) Selective use concentrated in complex cases, even with high overall PNDP uptake. Among participants implementing a documentation process only for selected patients, the selected cases were described as those with complex medical profiles, with or without urgent medical supervision. This aligns with the role of PNDP as a structured framework for systematic care planning, but it also reflects a divergence from the ideal of routine use across all cases. Prior evidence often links selective or partial implementation to time pressure and workflow burden (Kim & Baek, 2013; O'Sullivan et al., 2019; Vivanti et al., 2018). In the present data, time-intensive processes were also the most frequently reported drawback of standardised language use, supporting the same practical constraint.

(b) Reported difficulty patterns were narrower than expected. International findings often describe persistent implementation barriers even where knowledge and familiarity increase (Porter, Jane M. et al., 2015; Vivanti et al., 2018). In the present sample, most PNDP users reported no difficulty with PNDP steps (56.6%), with difficulty concentrated mainly in nutrition diagnosis and nutrition intervention (17% each). This differs from contexts where difficulty is more consistently reported across multiple steps or where sustained burden persists despite exposure and training initiatives. This may indicate that familiarity with the framework is relatively high among current users, even though efficiency-related barriers remain unresolved.

5.9.4 Context specific explanations

(a) Education driven adoption may have outweighed system driven adoption. The dominant sources of awareness were university seminars and clinical placement exposure, while CyDNA educational programmes were less frequently reported as the source. This pattern supports early exposure as a practical driver of PNDP uptake, even when national level messaging is not uniformly recognised.

(b) GHS requirements may encourage documentation, but not standardisation. In Cyprus, documentation related requirements exist for GHS affiliated practice, including mandatory anthropometric reporting and PNDP inclusion in specific administrative processes such as requests to exceed the allowed number of visits per patient per year.

These requirements can increase the perceived need to document, but the lack of structured electronic fields and the limited system access for dietitians reduce the likelihood of consistent, standardised documentation within the platform.

(c) Digital limitations shape how PNDP is expressed in practice. International evidence shows that structured electronic features such as preformatted statements and drop-down options support sustainability and reduce implementation friction (Lovestam et al., 2017; O'Sullivan, 2013). In Cyprus, free text entry without embedded structure places the burden of formatting on the practitioner. Under these constraints, implementation may appear high at the level of self-reported use, while standardisation, consistency, and audit readiness remain variable between practitioners and settings.

Overall, divergence from previous studies was most visible in the combination of high reported PNDP uptake with limited electronic infrastructure, mixed awareness of professional endorsement, and a practice landscape dominated by private settings. These conditions support a model where PNDP adoption is present, but implementation quality and standardisation depend heavily on local workflow, training exposure, and the structural limits of the GHS electronic environment.

The expert validation findings further support the view that a structured electronic PNDP format may be feasible and practically useful, while also indicating that training and adaptation time remain important for successful uptake.

5.10 Contribution to Knowledge

This study contributes to knowledge by addressing a clearly defined gap in Cyprus, adding empirical evidence on PNDP implementation and electronic tool feasibility, and strengthening the implementation science discussion within dietetics. Originality is grounded in context, design, and focus, rather than claims of wide impact.

5.10.1 Adding empirical evidence on PNDP implementation and electronic tool feasibility

The international literature has largely examined the NCP and its terminology (NCPT), with limited research explicitly focused on PNDP implementation. Where evidence exists, stronger implementation is consistently associated with settings where electronic health records can accommodate structured documentation, including templates and drop-down options for PAS statements, while manual formats are more frequently described as inconsistent and time-consuming (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vinci et al., 2023). Barriers such as insufficient time and limited training are also repeatedly reported across countries, even when awareness is high (Kim & Baek, 2013; Vinci et al., 2023; Vivanti et al., 2018).

This study adds empirical evidence by examining PNDP use and perceived feasibility within the Cypriot practice environment, alongside a structured development and expert evaluation of an electronic PNDP tool (e-ΔΔΔΦ). The design combines current practice mapping with a focused assessment of a proposed digital solution, rather than treating electronic documentation as a general concept. Findings from the first questionnaire show substantial PNDP uptake in Cyprus, with most users reporting full implementation of the steps, while reported difficulties cluster around time burden and challenges within nutrition diagnosis and intervention steps. These local patterns align with international trends observed for NCP implementation, where training, time, and system integration shape uptake and sustainability (Lovestam, Vivanti et al., 2019; O'Sullivan, 2013; Porter, Jane M. et al., 2015).

The expert validation results further extend the literature on structured digital documentation by providing structured ratings on relevance, clarity, and simplicity across tool sections, supported by qualitative comments. High overall ratings indicate that an electronic PNDP format can be judged as suitable in principle, while still leaving space for refinement before clinical deployment. The contribution therefore lies in empirical documentation of feasibility and acceptability signals for an electronic PNDP format in a setting where validated tools are not currently available, rather than claims of proven clinical effectiveness.

A further contribution is the observation that, among professionals who use a documentation process only for selected patients, the described patient profiles tend to involve complex medical status, with or without urgent medical supervision. This pattern supports the view that structured documentation is prioritised when cases are more demanding and when clear record keeping is more critical. In this sense, the results provide practice-based evidence that perceived value of a structured framework increases with case complexity, even when routine use is not universal.

5.10.2 Contribution to implementation science in dietetics

Implementation science is concerned with how evidence-based frameworks are adopted, supported, and sustained within real systems. The PNDP framework is grounded in the NCP and shares its standardised structure, which means implementation is likely to be shaped by similar conditions, including time efficiency, workforce demands, professional support, and infrastructure readiness. International findings indicate that professional endorsement by national dietetic associations, peer support, leadership reinforcement, and electronic system compatibility can facilitate implementation, while time and limited training remain persistent barriers (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vinci et al., 2023).

This study contributes to implementation science in dietetics in three distinct ways. First, at the level of implementation determinants, it identifies context-specific factors influencing the potential uptake of structured nutrition documentation in Cyprus. These include uneven awareness of formal recommendations, variability in perceived feasibility of standardised methods, and clear signals that alignment with the GHS environment is a dominant consideration when selecting a framework. This supports the broader implementation literature showing how adoption is shaped not only by the perceived value of a framework, but also by its fit within national organisational and documentation systems.

Second, at the level of implementation-informed design, the study translates perceived barriers to practical design feature requirements. Previous literature describes how structured electronic elements, such as drop-down lists and preformatted PES options, can support routine documentation and reduce burden (Lovestam et al., 2017; O'Sullivan, 2013). The development and expert appraisal of e-ΔΔΔΦ extends this by applying those principles into a PNDP-focused prototype tailored to the Cypriot context. In this respect, the study contributes not simply by producing a tool, but by demonstrating how implementation barriers can be operationalised into concrete design features intended to support clarity, simplicity, and workflow alignment. At the same time, it does not assume that digitalisation alone can overcome broader constraints such as limited training or time.

Third, at the level of future implementation strategy, the study offers an empirically grounded basis for planning realistic next steps for PNDP adoption in Cyprus. International studies highlight that education, ongoing support, and organisational endorsement are central to adoption (Kim & Baek, 2013; Porter, Jane M. et al., 2015; Vivanti et al., 2018). The present findings similarly indicate that training needs and time demands remain salient. Accordingly, the study helps inform a realistic implementation pathway based on phased introduction, alignment with existing GHS documentation expectations, and structured training tied to routine workflows. Its contribution, therefore, is not to claim immediate system-wide adoption, but to outline the conditions under which implementation may become more achievable and sustainable in the Cypriot setting.

Overall, the originality of this contribution lies in linking three levels of inquiry within a single programme of work: the identification of local implementation determinants, the translation of those determinants into a prototype digital response, and the generation of a context-sensitive pathway for future adoption. In this way, the study adds a grounded Cyprus-specific contribution to the literature on documentation framework implementation and digital feasibility in dietetics, while recognising that long-term uptake depends on system readiness, training capacity, and workflow integration.

5.11 Clinical Practice Implications

5.11.1 Implications for routine documentation

Routine documentation benefits when PNDP is used as the default structure, not only as an option for high complexity cases. Across international evidence, structured use of NCP and NCPT, particularly when supported by electronic templates and drop-down options, is associated with improved documentation quality and more consistent recording practices (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019). In contrast, manual documentation is more frequently described as inconsistent and time-intensive, which increases variation between practitioners and reduces record usability (O'Sullivan et al., 2019; Vivanti et al., 2018).

Within the current Cypriot context, routine structure has additional importance because national requirements exist for parts of the dietetic record, such as anthropometric reporting within the public system. A structured PNDP note format can support completeness and clarity when exceptions occur, for example when anthropometric assessment is not recommended due to acute illness or limb deformation or amputation, and when documentation still needs to remain explicit and consistent (Casadei & Kiel, 2025). This strengthens the case for adopting a structured documentation approach that supports both clinical and regulatory expectations.

5.11.2 Implications for clinical reasoning

PNDP provides a standardised framework that makes the link between assessment findings, the stated nutrition diagnosis, the chosen intervention, and monitoring and evaluation more visible in the written record. This matters most at points where prioritisation and justification are required, such as selecting the main nutrition diagnosis and defining measurable monitoring indicators. Standardised language and structured diagnosis statements, including the PAS format, can support this by reducing variability in how nutrition problems are described and by making documentation easier to follow across time (Lovestam et al., 2017; Vinci et al., 2023).

In the present findings, nutrition diagnosis and nutrition intervention were among the steps more often reported as difficult within PNDP use. This aligns with the wider literature, where training and familiarity are repeatedly linked to stronger implementation, while time constraints remain a persistent limiting factor even when confidence improves (Kim & Baek, 2013; Porter, J. M. et al., 2015; Porter, Jane M. et al., 2015; Vivanti et al., 2018). For practice, this indicates that strengthening training and providing structured prompts within documentation systems may be more impactful than promoting the framework in principle alone.

5.11.3 Implications for continuity of care

Continuity of care depends on whether follow-up notes can be interpreted quickly and consistently, including by the same practitioner across time and by other practitioners when care is transferred. Evidence indicates that electronic formats support better retrospective accessibility and facilitate continuity by keeping records legible, structured, and retrievable (Lovestam et al., 2017; O'Sullivan, 2013). In O'Sullivan (2013) electronic documentation was preferred over paper because it supported retrospective access, integration with electronic health records, and greater time efficiency, even when the tool was not fully functional across all steps.

In Cyprus, continuity is challenged by restricted visibility of dietetic documentation within the national electronic platform and by limited functionality compared with other healthcare professionals. Dietitians have limited or indirect access to patient records. This reduces the integration of dietetic input into the wider care record and may weaken the practical influence of nutrition care planning across settings. A structured electronic PNDP tool that supports consistent headings and step-based recording can support continuity even when the hosting platform remains a free text environment, because it reduces variation in note layout and content expectations.

5.11.4 Implications for interdisciplinary communication

Interdisciplinary communication improves when dietetic documentation is predictable in structure and understandable in terminology. Studies describe standardised language as supporting clearer communication and stronger demonstration of professional practice in multidisciplinary care (Lovestam et al., 2017; Vinci et al., 2023). This aligns with the present questionnaire findings, where better communication among healthcare professionals, including clearer documentation and record keeping, was the most frequently reported benefit of standardised language. In addition, many participants indicated that standardised language is expected to change perceptions regarding the value of the nutrition and dietetic contribution. This indicates that documentation is not only a clinical record, but also a visibility tool within interdisciplinary care.

However, the literature also highlights that communication gains are most sustainable when terminology use is embedded into routine workflow through electronic templates and when professional support is present, such as endorsement from national dietetic associations and peer support (Lovestam, Vivanti et al., 2019; Vinci et al., 2023). Where these conditions are absent, or where electronic systems cannot support structured entry, documentation remains dependent on individual effort and local habits, which limits consistency and reduces interdisciplinary usability.

5.12 Implications for PNDP Education and Training

Professional education and training shape whether PNDP is used as a consistent framework in practice, or as an optional structure applied only in selected cases. Across the literature, limited training and lack of support appear repeatedly as barriers, alongside time constraints and system readiness (Lovestam, Vivanti et al., 2019; O'Sullivan et al., 2019; Vinci et al., 2023). Local results also suggest that although PNDP is the most used DP, difficulties are concentrated in specific steps, particularly nutrition diagnosis and nutrition intervention.

Undergraduate education is a key entry point for normalising PNDP as a framework for documentation and care planning. Results show that most participants became aware of a DP through university seminars and clinical placement exposure, while fewer reported awareness through professional association programmes. This places clear responsibility on academic programmes and placement structures to provide consistent early exposure. PNDP should ideally be presented early as the default structure for documenting dietetic care, rather than as an additional method introduced after qualification, so that continuity is established between academic learning and placement expectations. Teaching should also reflect the steps that are most often identified as difficult in practice. Local data show that nutrition diagnosis and nutrition intervention were the most frequently reported difficult PNDP steps among users. Repeated practice in writing diagnosis statements, selecting appropriate interventions, and linking them to assessment findings may therefore reduce inconsistency in later documentation. Placement educator alignment is also important, because implementation is strongly shaped by professional support and workplace reinforcement (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019). When placement settings use different documentation habits, students receive mixed signals about what is expected. Collaboration between universities and placement sites, including shared templates and minimum documentation standards, may help reduce this variation. Local language access also remains important. Participants identified translation and the availability of Greek terminology as a way to introduce standardised language in academic settings. Even when terminology is available in English, its practical use within a Greek-speaking system can be inconsistent, particularly for early-career NDPs.

CPD remains equally important because awareness does not automatically translate into full implementation. In multinational data, lack of training and limited knowledge were common barriers even where awareness was high (Lovestam, Vivanti et al., 2019; Vinci et al., 2023). In Korea, managers reported high exposure to education while still rating knowledge as moderate or poor, and describing insufficient knowledge as a barrier even in settings already using the NCP structure (Kim & Baek, 2013). This supports CPD approaches that are applied, repeated, and linked to daily workflow. A key focus is time and workflow, since time demands were consistently reported as a major barrier in the INIS study and in Australian data over time (Lovestam, Vivanti et al., 2019; Vivanti et al., 2018). CPD sessions that demonstrate shorter documentation pathways, use of templates, and prioritisation within the framework may support feasibility without weakening structure. The practice context in Cyprus further strengthens this need. Many participants work in private practice without other HCPs present. In such settings, peer reinforcement and workplace prompts may be limited, and documentation habits may depend more heavily on individual preference. CPD can therefore provide shared standards, common templates, and a form of professional reinforcement that may otherwise be missing from the local practice environment.

Across both undergraduate and post-qualification contexts, PNDP training is likely to be most effective when treated as a staged pathway rather than a single seminar. This aligns with evidence showing that implementation improves when supported by organisational endorsement, peer support, and tools that fit routine documentation (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; Vinci et al., 2023). Training that is step-based and linked to real records is likely to be more effective when it mirrors routine documentation rather than remaining at the level of standalone theory. This is supported by findings from implementation packages and prototype testing, where structured formats and guided menus were reported as helpful (O'Sullivan, 2013; Porter, J. M. et al., 2015). Competency-focused practice is particularly important for the steps that users find most difficult. Local findings show reported difficulty clustering in nutrition diagnosis and nutrition intervention; training should therefore focus on linking assessment findings to diagnosis statements, selecting intervention options, and defining monitoring elements that match the planned care. Reinforcement through peer review and short feedback cycles may further strengthen uptake, since peer support was one of the strongest enablers across studies (Lovestam, Vivanti et al., 2019; Vinci et al., 2023). In settings where peer support is not naturally available, structured peer review groups delivered through CPD may provide this function. Alignment with national requirements may also increase relevance. In Cyprus, documentation expectations within the GHS include mandatory anthropometric reporting and PNDP inclusion in specific approval documents. Training that links PNDP documentation to these practical requirements may therefore increase relevance, consistency, and routine use in clinical notes.

Electronic tools may further strengthen PNDP education and training when they reduce variation in documentation and provide a clear structure for completing each step. Across studies, electronic system readiness has been linked to higher implementation and better documentation quality (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019). Dietitians have also reported preference for electronic formats when these allow easier access to records, improved organisation, and reduced time pressure (O'Sullivan, 2013). Specific features that may support learning include templates, step-based menus, and structured choices for diagnosis and intervention terms. In Sweden, adoption improved when EHR systems were modified to include drop-down lists and preformatted options, suggesting that embedded structure supports routine completion (Lovestam et al., 2017). In prototype testing, participants preferred electronic IDNT to paper because of ease of use and accessibility, and the tool was also viewed as useful for training because it guided completion through the steps (O'Sullivan, 2013). These functions are especially relevant in Cyprus, where existing electronic notes are often entered as free text without predefined structure. A structured electronic PNDP tool may therefore function not only as a documentation support, but also as a learning support, by shaping how information is entered and reducing inconsistency between practitioners.

5.13 Health System and Policy Implications

Health system and policy implications centre on documentation requirements, digital integration, and the formal place of dietitians within clinical care. In Cyprus, documentation is already linked to GHS processes, including mandatory recording of anthropometric measurements and the submission of PNDP-related documentation when approval is requested for additional visits beyond the annual allowance. These requirements place structure at the centre of service delivery, but they also expose a practical gap. When documentation is completed in free text fields without a consistent format, audit activity remains focused on compliance, while quality indicators are difficult to extract and compare across providers.

Integration of PNDP into electronic health records is therefore not only a technical upgrade. It is a policy tool. Evidence from international settings shows higher uptake and more sustainable use of structured care processes when electronic systems include templates, drop-down options, and preformatted diagnosis statements, including PAS formats (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; O'Sullivan, 2013; Vinci et al., 2023). Formatting...Within the GHS context, electronic integration also addresses the current imbalance in access and visibility, where dietitians may be required to document within the platform but remain restricted in the information and functions available to them compared with other healthcare professionals.

Recognition of dietitians' clinical role is closely connected to what the system can record, retrieve, and report. Standardised documentation makes dietetic input easier to locate within the patient record, easier to share within multidisciplinary care, and easier to include in service evaluation. When quality criteria linked to compensation and clinical management guidelines are being introduced, as described in the Cypriot context, structured dietetic documentation becomes a direct enabler of monitoring, accountability, and quality improvement rather than an optional professional preference (Theodorou et al., 2025). In this way, PNDP functions as a framework that supports consistent reporting, and electronic integration becomes the mechanism that allows that framework to operate at scale.

Relevance to digital health strategy emerges from the same point. A national digital health strategy relies on structured data, interoperability, and comparable records across services. Dietetic records that remain unstructured limit secondary use, including audit, service planning, and system-level evaluation. Embedding PNDP-aligned fields into GHS documentation supports data quality and continuity, while also strengthening the position of dietitians within the electronic care pathway. This alignment supports a system in which dietetic care is documented as part of routine clinical activity, not as a parallel note that is difficult to track, review, or include in quality measurement.

5.14 Strengths of the Study

This study has several methodological and applied strengths that enhance the credibility, relevance, and contribution of the findings. First, the mixed-methods design enabled triangulation between quantitative and qualitative evidence, supporting stronger internal validity. Quantitative results described current patterns of practice and levels of PNDP use, while open-ended responses added explanatory detail regarding perceived advantages, disadvantages, and the contextual conditions that shape implementation. This combination reduced reliance on a single data type and supported interpretation with both breadth and depth, including convergence between numerical trends and thematic findings.

Second, the study was grounded in real-world practice conditions in Cyprus, capturing experiences from private practice, public settings, and General Health System (GHS)-related documentation realities. This strengthens the practical significance of the results, as the findings reflect routine constraints and workflow demands rather than controlled or idealised settings. The Cypriot context is particularly important given the limited local availability of validated electronic PNDP tools and the infrastructure barriers described in the wider implementation literature.

Third, the research moved beyond descriptive reporting by developing a contextually adapted electronic PNDP tool and evaluating it through structured expert validation. The use of quantitative ratings (relevance, clarity, and simplicity), complemented by qualitative feedback, provided transparent and criterion-based evidence to guide iterative refinement. This strengthens credibility because tool evaluation was anchored in documented assessment domains rather than informal impressions, and it aligns with broader evidence that structured digital formats can support documentation quality and feasibility when designed to fit clinical workflow.

Finally, the study incorporated perspectives from practitioners working both within and outside the GHS and across multiple districts, strengthening contextual coverage of dietetic practice in Cyprus. Throughout the research process, reflexivity and supervisory oversight were maintained to support methodological transparency and minimise the influence of single-researcher interpretation on analytical decisions.

5.15 Limitations of the Study

This study provides a first snapshot of current documentation practices and perceptions in Cyprus, alongside an initial evaluation of an electronic PNDP tool. Several limitations should be acknowledged, not to dismiss the findings, but to frame how far they can be taken.

The main survey included 63 nutrition and dietetic professionals, which was considerably lower than the planned sample size (n = 218). This reduced the statistical power of inferential analyses and contributed to sparse cell counts, requiring category collapsing and limiting the feasibility of pairwise testing. As a result, the absence of statistically significant associations should not be interpreted as evidence that relationships do not exist, but rather as an indication that the study may not have been adequately powered to detect them. The sample also reflects a high proportion of early-career practitioners, with a mean age of 27.4 years and a mean practice duration of 9.6 months, which may not fully represent the wider professional population.

In addition, responses were concentrated in specific districts and practice settings, with most participants reporting practice in cities and a large proportion working in private offices without other healthcare professionals. Two responses were also collected from abroad (Athens and UK) and were retained due to the low response rate. These characteristics limit generalisability, particularly to dietitians working in public sector services, inpatient environments, or rural settings.

The study design was cross-sectional and captured responses at a single time point. This limits interpretation to descriptions of current practice and reported perceptions rather than change over time. Associations between variables, where explored, cannot be interpreted as causal. For example, higher PNDP use among some subgroups may relate to training exposure, workplace expectations, or individual practice context, but direction and causality cannot be established within this design.

The study relied on self-reported data for awareness, use of documentation processes, and perceived difficulties. Such measures are vulnerable to response bias, including over-reporting of use or confidence due to professional expectations. This is particularly relevant for questions related to standards, recommended practice, or perceived competence. Some internal inconsistencies were also observed across items, such as variation in the number of participants reporting non-use of a documentation process across different questions, suggesting that interpretation of certain items may have varied across respondents. These factors indicate that reported uptake and confidence should be interpreted as indicative trends rather than precise estimates of behaviour.

Data collection occurred in two phases with a substantial gap between timeframes, including an interruption of approximately one year due to the researcher's personal circumstances. This may have introduced temporal effects (e.g. double entries, changes in training exposure, practice context, or system-level developments) and reduced comparability between participants responding in different periods.

A further limitation relates to the survey platform. Google Forms does not record the number of survey page visitors or individuals who view the consent page without submitting a response. As a result, recruitment and participation rates could not be calculated, and only fully completed submissions were available for analysis. Relatedly, partial response patterns and drop-out points could not be quantified.

No weighting or propensity score adjustments were implemented to account for potential non-representativeness of the achieved sample; therefore, analyses were based on unadjusted data. Alongside the small achieved sample size, this limits the generalisability of findings and increases the likelihood that observed estimates differ from the broader NDP population.

Open-ended responses were coded into themes to enable descriptive analysis. Although coding was reviewed by the supervisor, theme assignment remains dependent on interpretation, especially where answers were brief, ambiguous, or contained overlapping meanings. In addition, many open-ended questions allowed multiple themes per participant, which meant that inferential testing was not appropriate due to violation of mutual exclusivity assumptions. The qualitative findings therefore support contextual understanding of the quantitative results but should not be interpreted as exhaustive accounts of attitudes or experiences.

Evaluation of the electronic tool was based on expert validation (N = 7) using ratings of relevance, clarity, and simplicity, alongside qualitative comments. This provides an important first step for content and design appraisal, but it does not replace real-world testing in routine clinical conditions. The validation sample was small, and demographic information was not collected, which limits interpretation of how representative the panel was across sectors or experience levels. In addition, the study focused on expert judgement of screenshots and sections rather than longitudinal use, integration into existing electronic health record environments, or assessment across different patient types and workflow demands.

This limitation is consistent with the wider literature, where electronic NCP tools are often tested in restricted conditions and may exclude certain clinical groups or follow-up functions due to resource constraints (O'Sullivan, 2013). As such, the present findings support the feasibility and acceptability of the tool's structure, but do not confirm its effectiveness, efficiency, or impact on documentation quality during sustained clinical use.

Finally, the tool was developed by the researcher who is not a computer expert. Therefore, the user experience, interface and functional capabilities were necessarily shaped by the developer's non-specialist programming skillset, which may have constrained the optimisation of usability, automation, and scalability features.

5.15.1 Sample Size Justification

The achieved sample was smaller than originally estimated. This should be interpreted in light of several practical and methodological constraints associated with recruitment and questionnaire design. The study relied on an open survey and convenience sampling approach within a relatively small and specialised professional population, with participation based entirely on self-selection. Dissemination occurred primarily through social media platforms, which may have limited participation among otherwise eligible nutrition and dietetic professionals who do not use these platforms regularly or for professional purposes. Although the questionnaire was also distributed through the Cyprus Dietetic and Nutrition Association (CyDNA) members' newsletter, not all nutrition and dietetic professionals in Cyprus are registered members of the association. Consequently, not all eligible professionals were equally likely to be reached, and the opportunity to participate may not have been uniform across the wider professional population (Keat et al., 2023).

In addition, some demographic and practice-related items assume direct patient- or client-facing practice, whereas eligible nutrition and dietetic professionals may also work in non-clinical roles, including academia, research, public health, administration, food service, or industry. The absence of response options reflecting this broader professional diversity may have reduced the perceived relevance of the questionnaire for some potential respondents and may have contributed to self-exclusion from participation. For those who did participate despite working outside direct care settings, some responses may not have fully reflected their current professional context (Lovestam, Steiber et al., 2019). Given the low achieved response, the possibility of non-response bias should also be acknowledged, as this may limit the generalisability of the findings beyond those who elected to participate.

Similar limitations have been noted in the wider literature, where low response rates among health professionals have been recognised as a common challenge and a potential source of non-response bias. Published studies have also acknowledged that financial constraints may restrict the use of response-enhancing approaches, such as postal distribution or incentives, both of which have been associated with improved participation. Specifically, O'Sullivan et al. (2019) report a response rate of 6%, partly attributing it to the low budget of the study that restricted them from using such response-enhancing approaches. Additionally, Lövestam et al. (2020) report a response rate of 10-30% by some of the countries included in their study. This suggests that recruitment limitations of this kind are not unique to the present study but reflect broader methodological challenges in survey-based research involving health professionals.

Future studies should therefore explore recruitment strategies that are both broader and feasible within limited-resource contexts. These may include repeated reminder schedules, personalised email invitations, collaboration with employers or professional bodies for direct distribution, workplace-based dissemination, telephone invitations, postal follow-up where feasible, and ethically appropriate incentives. Evidence from the online survey literature also suggests that response rates may be strengthened by contacting potential participants in advance, combining online surveys with additional modes of administration where practical, and using telephone reminders to support follow-up (Wu et al., 2022). Additionally, the time gap between the recruitment phases due to researcher's personal reasons, may affected response flow.

The length of the questionnaire may also have reduced willingness to participate. Longer questionnaires are known to increase response burden and have frequently been associated with lower response or completion rates, particularly in web-based and health professional surveys where participants may already face substantial time pressures (Rolstad et al., 2011).

Nevertheless, these limitations should not be taken to mean that the findings are without methodological value. As this phase was intended primarily to generate an exploratory understanding of local documentation practices and to inform the initial development of the electronic tool, the qualitative components of the questionnaire were especially valuable in capturing contextual detail and practice-based perspectives. In line with qualitative methodological literature, the usefulness of such data is not determined exclusively by sample size, but also by the extent to which the data provide relevant and sufficiently informative insight for the purpose of the study (Vasileiou et al., 2018). Additionally, appropriate measures were undertaken to ensure cautious interpretation of the results. To minimise statistical error, analyses were adapted to the achieved sample using exact tests, Monte Carlo estimation, effect-size reporting (Cramer's V), and correction for multiple comparisons (Bonferroni, Benjamini-Hochberg) (Ben-Shachar et al., 2023; Chen et al., 2017; Dexter et al., 2017; McHugh, 2013). Thus, although the limited sample constrains statistical generalisability and increases the possibility of non-response bias, the findings remain informative for the exploratory and developmental purpose of this study phase.

5.15.2 How these limitations affect interpretation

Taken together, these limitations suggest that the findings should be interpreted as exploratory. The results are most useful for identifying patterns, mapping current practice, and highlighting priorities for training, standardisation, and digital development. They do not provide definitive estimates of PNDP uptake across Cyprus, nor do they allow strong conclusions about determinants of use or the performance of the electronic tool in routine practice. Future work would benefit from a larger and more balanced sample across settings, along with prospective usability testing that examines workflow fit, time demands, and integration within existing electronic systems.

5.16 Recommendations for Future Research

Research on PNDP implementation remains limited, and much of the available evidence continues to rely on findings from NCP and NCPT studies as a close proxy (Lovestam et al., 2019; Vinci et al., 2023). The present study contributes initial evidence from Cyprus and supports the value of continued work that moves beyond early adoption patterns and into routine use, system integration, and measurable outcomes. The following directions are recommended.

5.16.1 Longitudinal and implementation-focused studies

Most existing findings are based on cross-sectional snapshots of awareness, attitudes, and self-reported use. Longitudinal designs could track changes in PNDP use over time, including sustained use of later steps such as monitoring and evaluation, and the conditions under which routine uptake is maintained. Designs such as pre- and post- training studies, phased implementation studies, or follow-up surveys after introduction of structured electronic templates would align with earlier implementation work showing that time, training, and organisational support shape adoption (Lovestam et al., 2017; Porter, Jane M. et al., 2015; Vivanti et al., 2018).

5.16.2 Larger and more representative national samples

Future studies would benefit from larger national samples that better reflect the distribution of NDPs across districts, sectors, and roles, including private practice and GHS-related services.

The multinational evidence suggests that implementation patterns vary substantially across settings and countries, and that results can be influenced by uneven response representation (Lovestam, Vivanti et al., 2019; Vinci et al., 2023). National sampling approaches that aim for balanced participation across practice contexts could improve precision and strengthen subgroup comparisons within Cyprus.

Future online survey studies should consider recruitment procedures that have been associated with improved response rates in the literature, such as contacting potential participants in advance, combining online questionnaires with additional survey modes where feasible, and using telephone reminders to encourage completion. These approaches may help strengthen participation while reducing sole reliance on passive electronic dissemination.

5.16.3 Patient-level outcome evaluation

Evidence frequently describes improved documentation quality and better workflow fit when structured documentation is used, yet patient-level evaluation remains limited in many contexts. Future work could assess patient-related indicators alongside PNDP use, such as continuity of care markers, follow-up completion, documentation completeness, and measurable nutrition care targets. Where feasible, outcomes could be examined in relation to structured terminology use, given that several studies link structured documentation and standardised terminology with improved communication and clearer records (Lovestam et al., 2017; O'Sullivan, 2013).

5.16.4 Integration with full EHR systems

Findings across the literature show stronger uptake when electronic systems support structured documentation through templates and selectable fields, including PAS-related structures (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019). Future research could test integration pathways for electronic PNDP tools within full EHR environments, focusing on feasibility, permissions, access to patient information, and compatibility with routine workflows. Practical questions such as system permissions, structured fields, and secure data handling remain central, particularly under GDPR-informed conditions already discussed in implementation work (O'Sullivan, 2013).

5.16.5 Economic and time efficiency analyses

Time burden is one of the most consistent barriers reported across regions, even when familiarity improves (Lovestam, Vivanti et al., 2019; Vivanti et al., 2018). Future studies could include structured time measurement approaches, such as task-based timing, workflow observation, or comparative completion time across paper and electronic formats. Economic evaluation could also be included, examining development costs, training requirements, staffing implications, and potential time savings linked to structured electronic design. This direction aligns with earlier evidence showing that electronic design features can improve feasibility and perceived efficiency, while also requiring upfront investment (Ammenwerth et al., 2001; O'Sullivan, 2013).

5.16.6 Setting-specific studies across sectors and patient complexity

Results from multiple contexts suggest that uptake differs by setting, with higher use often reported in inpatient services compared with public health environments (Lovestam, Vivanti et al., 2019). Cyprus specific research could examine PNDP use across sectors, including private practice, outpatient services, and hospital-linked care.

To provide clarity regarding the extent to which the study objectives and hypotheses were addressed, Table 5.0 summarises the level of empirical support and interpretative conclusions derived from the findings.

Table 5.0: Evaluation of Research Aims and Hypotheses Achievement

Study objective / question	Achieved?	Level of support	Evidence from findings	Interpretation
Assess current documentation practices, awareness, and structured language use among NDPs in Cyprus, with particular focus on PNDP	Yes	Strong	Phase 1 descriptive and qualitative findings	Provided an exploratory national baseline of current documentation practices and implementation variability
Explore perceptions of the value, feasibility, barriers, and facilitators associated with structured documentation	Yes	Strong	Phase 1 quantitative and thematic findings	Identified perceived benefits, barriers, and contextual influences relevant to implementation
Identify organisational, technological,	Partially	Moderate	Survey findings on training, workflow, GHS alignment,	Findings highlighted likely influencing factors, but causal or

educational, and practice-related factors influencing adoption and longer-term integration			and implementation considerations	predictive relationships were not established
Develop a context-specific electronic PNDP tool informed by local needs	Yes	Strong	Prototype development process and final tool description	Produced a context-adapted Greek electronic PNDP prototype
Evaluate the expert-perceived relevance, clarity, simplicity, and practical acceptability of the electronic PNDP tool	Yes	Strong	CVI results and expert qualitative feedback	Expert evaluation supported early feasibility and practical acceptability, with minor refinement needs identified

5.17 Overview of the PhD Research Journey

Figure 5.0 visually summarises the progression of this doctoral research from problem identification to conceptual contribution and policy implications. The journey began with recognition of variability in PNDP implementation and the absence of validated digital tools within the Cypriot healthcare system. A systematic literature review informed identification of conceptual, methodological, and contextual gaps, leading to the development of a mixed-methods research design grounded in pragmatic philosophy. The creation and validation of a context-specific electronic PNDP tool constituted a central applied contribution of the thesis. Through quantitative and qualitative integration, the study advanced understanding of documentation format as an implementation variable and generated policy-relevant insights for digital transformation of dietetic practice in Cyprus. The flowchart illustrates both the methodological progression and the cumulative scholarly and practical impact of the research.

Figure 5.0. PhD Research Journey.

5.17.1 Dissemination and Impact of the Research

This doctoral research has extended beyond academic analysis to contribute directly to professional discourse and national development of dietetic practice in Cyprus. The systematic review component was published in a peer-reviewed journal, contributing to the international evidence base on NCP implementation. The development and validation of the electronic PNDP tool represents a practical output with potential for integration within the national health system. In addition, findings from the expert validation component also reported in the published manuscript to *Frontiers* (identification number: 1831101), suggest that the e-PNDP is a valid and practical tool that may support more standardised implementation of structured nutrition documentation in clinical settings, while also highlighting the continued importance of training, adaptation time, and implementation support for successful uptake. Engagement with the Cyprus Dietetic and Nutrition Association (CyDNA) further strengthens translational impact, positioning this research as both scholarly and a practice-relevant contribution.

The research team aims for more publications in peer reviewed journals, with manuscripts based on the following article titles:

- “Implementation of a Digitized Nutrition Care Process: Development and Clinical Utility in Dietetic Practice.”
- “Enhancing Clinical Nutrition Practice through Digital Innovation: A Mixed-Methods Validation of an Electronic Nutrition Care Process Tool.”
- “Standardizing Dietetic Care in the Digital Era: Development and Evaluation of an Electronic Nutrition Care Process Platform.”

5.17.2 Key Achievements of the Doctoral Research

The doctoral research journey included the following achievements and dissemination activities:

1. The study was delivered as an oral presentation at the 13th International Cyprus Dietetic and Nutrition Association Conference (07-09/11/2025).
2. The oral presentation received the Best Oral Presentation Award at the 13th Cyprus Dietetic and Nutrition Association Conference (09/11/2025).
3. Ethical approval for the study was obtained from the University of Nicosia Ethics Committee (UREC, Appendix V) (18/11/2021).
4. The study was granted the approval, auspices and support of the CyDNA (Appendix VI).

5. An abstract was accepted and published in the 13th Cyprus Dietetic and Nutrition Association Conference Book of Abstracts (ISBN 978-9925-7685-7-8) (Appendix VII).
6. The systematic review protocol was registered with PROSPERO (CRD420261279775), and a registration certificate was obtained (Appendix VIII).
7. Development of Phase 1 Questionnaire and dissemination through the CyDNA (Appendix III).
8. Development of the electronic tool e-ΔΔΔΦ, a context-specific electronic PNDP tool, with a user manual – pending ISBN (Appendix IX).
9. Development of Phase 3 Questionnaire, validation of the Greek e-ΔΔΔΦ (Appendix IV).
10. The study generated the first national-level empirical dataset on structured dietetic documentation practices in Cyprus.
11. Three manuscripts were prepared and submitted to peer reviewed journals.
12. Publication of a revised systematic review, at a peer-reviewed journal (*Healthcare*) (Appendix X).
13. Publication of the thesis manuscript and graphical abstract relating to the expert validation findings, with embedded training components, questionnaire results (Appendix XI and Appendix XII respectively).
14. Screenshots of the published manuscripts are presented below. The Revised Systematic Review (Figure 5.2, Appendix X) and the thesis manuscript (Figure 5.3, Appendix XI).
    - Article 1 (Figure 5.2) the revised systematic review, provides a comprehensive synthesis of the global evidence on the implementation of the NCP, highlighting persistent systemic barriers such as limited training, time constraints, and inadequate technological infrastructure. A key contribution of the study is its synthesis of international evidence on manual and electronic documentation formats, highlighting the added value of digital integration in relation to documentation quality, workflow efficiency, and practitioner confidence. The review advances the field by identifying consistent international patterns and emphasising the need for structured implementation strategies, while also highlighting the current lack of robust evidence linking NCP adoption to patient outcomes.
    - Article 2 (Figure 5.3) "Development and Content Validation of a Greek Electronic Tool for the Process for Nutrition and Dietetic Practice (e-PNDP): A Mixed-Methods Study in Cyprus", represents an important contribution to the advancement of standardised nutrition care, particularly within the context of digital health innovation and localised clinical practice. By developing and

validating the e-PNDP, the authors address a critical gap in the implementation of structured nutrition care tools in non-English-speaking settings.

Figure 5.1: Oral presentation award

Figure 5.2: Screenshot of the Revised Systematic Review

healthcare

an Open Access Journal by MDPI

Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings

Elina Polydorou; Stella A. Nicolaou; Dimitrios Papandreou; Antonis Zampelas; Eleni P. Andreou

Healthcare **2026**, Volume 14, Issue 9, 1235

Figure 5.3: Screenshot of thesis manuscript

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Development and Content Validation of a Greek Electronic Tool for the Process for Nutrition and Dietetic Practice (e-PNDP): A Mixed-Methods Study in Cyprus

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5.18 Chapter Summary/conclusions

This study contributes to understanding structured nutrition documentation by suggesting that digital format may function as more than a technological enhancement, acting instead as a structural mechanism for implementation, reasoning transparency, and professional visibility within a nationally regulated yet digitally evolving healthcare system.

This chapter synthesised the main interpretations from the literature review and the study findings, examining how structured documentation and standardised language influence nutrition and dietetic practice in Cyprus. PNDP was used as the organising framework for consistent documentation, while evidence from NCP and NCPT implementation studies was used to support interpretation because PNDP-specific research remains limited.

The literature shows that implementation outcomes depend largely on practical conditions. Uptake improves when training is available, professional bodies provide guidance, and electronic systems support structured entries through templates and drop-down options for PAS statements (Lovestam et al., 2017; Lovestam, Vivanti et al., 2019; O'Sullivan, 2013; Vinci et al., 2023). Common barriers include time constraints, limited training, and poor digital integration, even when benefits such as improved consistency and communication are recognised (Kim & Baek, 2013; O'Sullivan et al., 2019; Vivanti et al., 2018). Evidence from other healthcare fields supports the role of electronic documentation in improving completeness and clarity, reinforcing the importance of system support when standardised frameworks are implemented (Ammenwerth et al., 2001; Jin et al., 2021; Wang et al., 2013).

The study findings reflect these patterns in a Cyprus context. PNDP was the most frequently used documentation process, and most participants reported high self-rated knowledge and routine implementation across patients. However, difficulties were most often reported for nutrition diagnosis and nutrition intervention. Open-ended responses identified disadvantages mainly related to time demands, training needs, and disruption to workflow. Selective use also followed a consistent pattern: when documentation processes were applied only to selected patients, this typically involved complex cases, with or without urgent medical supervision. This suggests that structured documentation is prioritised when clinical management is more demanding. At the same time, the findings indicate that awareness and use do not necessarily translate into fully standardised or digitally supported implementation.

This chapter also clarified the local practice gap. Cyprus lacks validated electronic tools for nutrition care documentation, and existing electronic records do not provide predefined structure for dietetic notes. At the same time, national procedures already include structured recording requirements in specific settings, including mandatory reporting of anthropometric measurements and PNDP-related documentation within GHS procedures. This creates a gap between expectations and system support. Limited routine quality of care data collection and an audit focus on financial and regulatory compliance further reduce incentives for documentation quality improvement. These factors support the need for tools that enable consistent documentation and facilitate audit readiness.

This work makes two contributions. First, it provides Cyprus-based evidence on current documentation practices, including perceived benefits, barriers, and PNDP use. Second, it developed an electronic PNDP tool and confirmed its quality through expert validation, with high ratings for relevance, clarity, and simplicity. Together, these findings address an evidence gap and provide an applied basis for improving documentation consistency within the Cypriot context.

These interpretations form the foundation for the final chapter, which will synthesise the study's conclusions, outline its practical and policy implications, and present recommendations and priorities for future research and professional practice. The next chapter positions the electronic PNDP tool as a feasible step toward more standardised documentation in Cyprus and outlines recommendations for implementation support, including training, workflow alignment, and integration with existing digital infrastructure. It also considers the conditions under which such implementation may become more sustainable in routine practice.

CHAPTER 6 CONCLUSIONS

6.0 Conclusion

This chapter summarises the findings of the present study in relation to its research aim, objectives, and the existing body of international literature on standardised nutrition documentation and the NCP. By integrating quantitative and qualitative evidence, the study provides a comprehensive understanding of structured nutrition documentation practices, professional perceptions, and the potential role of digital support in shaping documentation quality, clinical reasoning, and professional practice among dietitians in Cyprus.

The findings indicate that current nutrition documentation practices are characterised by variability and inconsistency, largely influenced by the absence of integrated electronic tools and limited formal training in PNDP/NCP use. Taken together, the findings and expert validation results suggested that electronic implementation of PNDP-based documentation may offer advantages in terms of structure, clarity, efficiency, and support for clinical reasoning. These benefits were particularly evident in relation to standardised terminology use, documentation completeness, and perceived professional value, reinforcing the role of digital tools as facilitators rather than barriers to evidence-based dietetic practice.

Dietitians' perceptions emerged as a critical determinant of PNDP adoption. While the conceptual value of standardised language was widely acknowledged, concerns related to time demands, usability, and workflow integration persisted, particularly in the absence of supportive digital infrastructure. Importantly, the Greek electronic PNDP tool developed and evaluated in this study was perceived as usable and beneficial, with expert reviewers highlighting its potential to enhance consistency, support learning, and improve visibility of dietetic contributions within multidisciplinary healthcare teams.

When compared with international evidence, the study's findings largely align with reported barriers and enablers to NCP/PNDP implementation, such as the importance of training, peer support, and electronic health record integration. However, this research extends the literature by providing empirical data from the Cypriot healthcare context, where national-level digital limitations and fragmented documentation systems remain prominent challenges. In doing so, the study addresses a significant gap and contributes context-specific insights to implementation science in dietetics.

Overall, the study suggested that the format through which structured documentation is delivered may play an important role in its acceptance and effective use. The findings suggest that successful implementation of PNDP is not solely dependent on professional knowledge or motivation, but on the availability of user-centred digital tools that align with clinical workflows and health system requirements.

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APPENDIXES

Appendix I: GHS announcement ID 072023AHCP00330, regarding Nutrition Documentation notes.

<u>ΑΝΑΚΟΙΝΩΣΗ ΟΑΥ</u>

Αρ. Ανακοίνωσης: 072023AHCP00330

Προς: Κλινικούς Διαιτολόγους

ΘΕΜΑ: Καταγραφή Κλινικών Σημειώσεων στο Σύστημα Πληροφορικής

Ο Οργανισμός Ασφάλισης Υγείας εξετάζοντας βέλτιστες πρακτικές που εφαρμόζονται διεθνώς σχετικά με την καταγραφή κλινικών σημειώσεων, επιθυμεί να ενημερώσει τους παροχείς αναφορικά με τις πιο κάτω κατευθυντήριες οδηγίες ή/και πρότυπα ασφάλειας των δικαιούχων ή/και πρότυπα ποιότητας σε σχέση με την ορθή καταγραφή κλινικών σημειώσεων κατά την ολοκλήρωση της επίσκεψης.

Υπενθυμίζεται ότι η κλινική σημείωση είναι <u>υποχρεωτική</u> πριν την υποβολή οποιασδήποτε απαίτησης αποζημίωσης με την ολοκλήρωση της επίσκεψης. Στο εν λόγω πεδίο οι κλινικές σημειώσεις πρέπει να είναι πλήρεις, ολοκληρωμένες και σαφείς ώστε να αντικατοπτρίζουν την κλινική εικόνα του δικαιούχου, τη διατροφική αξιολόγηση και το διατροφικό πλάνο του δικαιούχου. Επίσης πρέπει να είναι επαρκείς ώστε να αιτιολογούνται οι οποιεσδήποτε περαιτέρω ενέργειες όπως ανανέωση παραπεμπτικών από τον ιατρό, αιτήματα προς παροχή επιπρόσθετων θεραπειών καθώς και η όποια διενέργεια δραστηριοτήτων.

Ο κλινικός Διαιτολόγος σε κάθε συνάντηση οφείλει να καταγράφει στις κλινικές σημειώσεις την πορεία του ασθενή σε σχέση με το διατροφικό πλάνο και τους διατροφικούς στόχους.

Πιο συγκεκριμένα, για την συμπλήρωση του πεδίου των κλινικών σημειώσεων απαιτούνται τα πιο κάτω:

1. <u>Διατροφική Αξιολόγηση</u>

Ιατρικό ιστορικό, φαρμακευτική αγωγή, μη φυσιολογικές αιματολογικές/βιοχημικές ή άλλες αναλύσεις, ανθρωπομετρήσεις, διατροφικά στοιχεία και υπολογισμοί ανάκλησης διατροφής, εκτίμηση αναγκών και τυχών περιβαλλοντικά/κοινωνικά στοιχεία

(*οι σημειώσεις να είναι περιληπτικές και ενδεικτικές*)

2. <u>Διατροφική και Διαιτητική Διάγνωση</u>

- Πρόβλημα, Αιτιολογία, Σημεία και Συμπτώματα

3. <u>Διατροφικό Πλάνο/Σχέδιο και Διατροφικοί στόχοι</u>

4. <u>Αναφορά στην Επαναξιολόγηση/Παρακολούθηση</u>

Δείτε πιο κάτω ένα ενδεικτικό παράδειγμα ορθής καταγραφής κλινικών σημειώσεων:

Ιστορικό: ΔΜ2, ΑΕΕ, ΔΛΔ, ΑΥ. Φαρμακευτική Αγωγή: Metformin 500mg tds, ASA, simvastatin 40mg od, λοιπή φαρμακευτική αγωγή έχει σημειωθεί. Αναλύσεις: gluc 175, alt 50, ast 45.
Βάρος: 105kg, Ύψος: 171cm, ΔΜΣ 35.9 Διατροφική ανάκληση: περίπου 2000kcal IBW: 70kg,

adj body wt: 80kg, REE=1743X1.3=2265kcal (50-20-30). Υψηλές τιμές γλυκόζης νηστείας λόγω άστατου ωραρίου και ψηλή πρόσληψη απλών υδατανθράκων. Δόθηκε διαιτολόγιο 2220kcal χαμηλό σε λιπαρά και αυξημένες σε φυτικές ίνες. Εκπαίδευση στις ποσότητες

φαγητών Στόχοι: 1. Συχνά και μικρά γεύματα 2. Πρόσληψη υγρών: 2,5L 3. Αποφυγή απλών υδατανθράκων. Παρακολούθηση σε 2 βδομάδες

Appendix II: GHS announcement ID DIET20220201, regarding completing the PNDP.

Αρ. Ανακοίνωσης: DIET20220201

Τροποποιήσεις στο έντυπο υποβολής αιτημάτων επιπρόσθετων θεραπειών σε Κλινικό Διαιτολόγο για εξαιρετικές περιπτώσεις

Ο Οργανισμός Ασφάλισης Υγείας επιθυμεί να ενημερώσει τους παρόχους αναφορικά με τροποποιήσεις στο έντυπο υποβολής αιτημάτων επιπρόσθετων θεραπειών σε Κλινικό Διαιτολόγο για εξαιρετικές περιπτώσεις (**Συνημμένο 1**).

Οι πιο πάνω αλλαγές τίθενται σε ισχύ στις 01 Φεβρουαρίου 2022.

01 Φεβρουαρίου 2022

ΟΡΓΑΝΙΣΜΟΣ ΑΣΦΑΛΙΣΗΣ ΥΓΕΙΑΣ

Συνημμένο 1

ΕΝΤΥΠΟ ΥΠΟΒΟΛΗΣ ΑΙΤΗΜΑΤΩΝ ΓΙΑ ΠΑΡΟΧΗ ΥΠΗΡΕΣΙΩΝ ΠΕΡΑΝ ΤΩΝ ΠΡΟΒΛΕΠΟΜΕΝΩΝ

Υπηρεσίες Κλινικής Διαιτολογίας

ΜΕΡΟΣ Α

Κωδικός ΓεΣΥ Δικαιούχου :………………………………………………………………………………..

Ημερομηνία Γέννησης :……………………………Φύλο: …………………………………………..……..

Διάγνωση (ICD10):…………………………………………………………………………………………

(1) Σύντομη περιγραφή του ιστορικού και κλινικής εικόνας του ασθενούς:

……

(2) Διατροφική Διάγνωση Πρόβλημα Αιτιολογία Συμπτώματα Σημεία (ΔΔ-ΠΑΣ) και Διατροφικοί Στόχοι:

……

(3) Καταγραφή των ενεργειών που έγιναν κατά τις προηγούμενες επισκέψεις π.χ. οδηγίες διαιτολόγου, αλλαγές βάρους, αλλαγές στη βιοχημεία, ΔΔ-ΠΑΣ και διατροφικοί στόχοι που υλοποιήθηκαν:

………………………………………………………………………………
……………………………

(4) Ενδείξεις για τις οποίες τεκμηριώνεται η ανάγκη για παροχή επιπλέον θεραπειών:

- επιπλέον ΔΔ-ΠΑΣ και διατροφικοί στόχοι που απορρέουν
  ………………………………………………………………………
  ……………………………
- ποια η ανάγκη για επιπλέον παρέμβαση
  ………………………………………………………………………
  ……………………………
- ποια τα αναμενόμενα αποτελέσματα από επιπλέον επισκέψεις
  ………………………………………………………………………
  ……………………………
- πρωτόκολλο θεραπείας-Medical Nutrition Therapy (MNT-evidenced based)
  ………………………………………………………………………
  ……………………………

□ Process of Nutrition and Dietetic Practice (να συμπληρωθεί το έντυπο στο ΠΑΡΑΡΤΗΜΑ 1 και να επισυναφθεί)

Προτεινόμενος αριθμός επιπλέον θεραπειών: ………………………………………………………..

Παρακαλείστε όπως υποβάλετε το προτεινόμενο πρωτόκολλο θεραπείας καθώς και οποιεσδήποτε άλλες συμπληρωματικές πληροφορίες όπως για παράδειγμα διεθνής βιβλιογραφία/κατευθυντήριες οδηγίες κ.α.

Appendix III: Phase 1 questionnaire

Εκτίμηση της γνώσης και χρήσης της Διαδικασίας Διατροφικής και Διαιτολογικής Φροντίδας (ΔΔΔΦ) από τους Κυπρίους εγγεγραμμένους/ επαγγελματίες Διαιτολόγους/ Διατροφολόγους με τις εξειδικεύσεις τους.

Το παρόν ερωτηματολόγιο έχει σκοπό να προσεγγίσει τους επαγγελματίες της επιστήμης διατροφής και διαιτολογίας (διατροφολόγος, διαιτολόγος, κλινικός διαιτολόγος ή και άλλη εξειδίκευση της διαιτολογίας - διατροφολογίας) της Κύπρου, ώστε να εκτιμηθεί η γνώση και η χρήση αυτών, σχετικά με την διαδικασία διατροφικής και διαιτολογικής φροντίδας (ΔΔΔΦ). Η συμμετοχή των πιο πάνω ειδικών είναι σημαντική και πολύτιμη για την διεκπεραίωση περαιτέρω ερευνών στο θέμα, με στόχο την βελτίωση της ποιότητας του επαγγέλματος και για την ύπαρξη ομοιογένειας στον τρόπο επικοινωνίας, αξιολόγησης, διατροφικής διάγνωσης και διατροφικής παρέμβασης.

Η συμπλήρωση του ερωτηματολογίου είναι ανώνυμη, ωστόσο εάν επιθυμείτε να ενημερωθείτε προσωπικά για την επερχόμενη έρευνα μας με σκοπό να δηλώσετε την συμμετοχή σας, παρακαλώ όπως συμπληρώσετε τα στοιχεία σας στο τελευταίο πεδίο του ερωτηματολογίου.

Το παρόν ερωτηματολόγιο έχει υιοθετηθεί και μεταφραστεί, με τροποποιήσεις με προσαρμογη συμφωνα με την Κυπριακη Νομοθεσια Ν31(ι) 96. Η ανάπτυξη των στοιχείων του ερωτηματολογίου βασίστηκε στην δομή της Διαδικασίας Διατροδικής Φροντίδας (Nutrition Care Process, NCP), όπως ορίζεται από την Ακαδημία Διατροφής και Διαιτολογίας, συμπεριλαμβανομένου του τετραβάθμιου μοντέλου (Αξιολόγηση, Διάγνωση, Παρέμβαση, Παρακολούθηση και Επαναξιολόγηση) και στις συλλογιστικές και διαγνωστικές αρχές του (Academy of Nutrition and Dietetics, 2013; Swan et al., 2017). Πρόσθετες οδηγίες αντλήθηκαν από το λογικό πλαίσιο

της Διαδικασίας για τη Διατροφή και τη Διαιτολογική Φροντίδα (Process for Nutrition and Dietetic Practice, PNDP)

που εκδόθηκε από τη Βρετανική Διαιτολογική Εταιρεία (British Dietetic Association, BDA 2021),

το οποίο εφαρμόζει τη λογική του NCP σε ευρωπαϊκά πλαίσια πρακτικής. Ελήφθησαν επίσης υπόψη οι ευρωπαϊκές αρχές εναρμόνισης της επαγγελματικής τεκμηρίωσης που διαδόθηκαν από την Ευρωπαϊκή Ομοσπονδία των Συλλόγων Διαιτολόγων (European Federation of the Associations of Dietitians, EFAD, 2012).

Επιπλέον, δημοσιευμένες μελέτες εφαρμογής που προσδιορίζουν τους παράγοντες που διευκολύνουν και τα εμπόδια στην υιοθέτηση της δομημένης τεκμηρίωσης λήφθηκαν υπόψην για την διαμόρφωση των στοιχείων (e.g., O'Sullivan, 2013).

- Η έρευνα τέθηκε υπό την αιγίδα του Συνδέσμου Διαιτολόγων και Διατροφολόγων Κύπρου (Συ.Δι.Κυ.).
- Καλούνται να το απαντήσουν επαγγελματίες διατροφής και διαιτολογίας που είναι μέλη του Συ.Δι.Κυ. και κατέχουν άδεια εξασκήσεως του επαγγέλματος από το Συμβούλιο Εγγραφής Επιστημόνων, Τεχνολόγων Τροφίμων και Διαιτολόγων Κύπρου (ΣΕΕΤΤΔ).

- Η έρευνα θα πραγματοποιηθεί σε δύο φάσεις. Το παρόν ερωτηματολόγιο ανήκει στην πρώτη φάση της έρευνας. Αποτελεί το διαγνωστικό κομμάτι της έρευνας και αποσκοπεί στην αξιολόγηση της αναγνώρησης της διαδικασίας διαιτολογικής και διατροφολογικής φροντίδας από τους Κύπριους εγγεγραμμένους/επαγγελματίες διαιτολογίας και διατροφής. Η δεύτερη φάση θα συμπεριλαμβάνει την συμμετοχή ομάδας εστίασης (focus group). Στο τέλος του ερωτηματολογίου μπορείτε να βρείτε σχετικό πεδίο δήλωσης ενδιαφέροντος για συμμετοχή στην δεύτερη φάση, δηλαδή στην ομάδα εστίασης.
- Η συγκατάθεση συμετοχής ζητείτε δια μέσου του ερωτηματολογίου και στις 2 φάσεις της έρευνας.

Το ερωτηματολόγιο είναι ΕΜΠΙΣΤΕΥΤΙΚΟ και η συμπλήρωση του είναι ΕΘΕΛΟΝΤΙΚΗ και δεν θα διαρκέσει περισσότερο από λίγα λεπτά.
Σας ευχαριστούμε πολύ για τον ενθουσιασμό και την υποστήριξή σας.
Στη Κύπρο υπεύθυνο Ίδρυμα για την πραγματοποίηση της συγκεκριμένης μελέτης είναι το Ερευνητικό Ίδρυμα Πανεπιστημίου Λευκωσίας με την κα. Ελίνα Πολυδώρου, PhD C και κύρια ερευνητρια (email: polydorou.e3@live.unic.ac.cy Τηλ: 99895807) και με υπεύθυνη καθηγήτρια τη Δρ. Ελένη Ανδρέου, Καθηγήτρια στο Τμήμα Ζωής και Επιστημών Υγείας του Πανεπιστημίου Λευκωσίας (email: andreou.el@unic.ac.cy Τηλ: 22841740).

Για την συμμετοχή σας στη μελέτη ΔΔΔΦ/PNDP-CY, πρέπει να έχετε ενημερωθεί και να παρέχετε την συγκατάθεση σας σχετικά με την πολιτική προστασίας προσωπικών δεδομένων της μελέτης. Στο πλαίσιο αυτό, θα θέλαμε να σας ενημερώσουμε για τα εξής:

(1) Οι υπεύθυνοι ερευνητές αναλαμβάνουν την ευθύνη για την συλλογή και στατιστική ανάλυση των πληροφοριών που παρέχονται ανώνυμα από εσάς για τις ανάγκες του ερευνητικού έργου.
(2) Κανένας τρίτος δεν θα έχει πρόσβαση με οποιονδήποτε τρόπο στις προσωπικές πληροφορίες των συμμετεχόντων κατά τη διάρκεια ή μετά την ολοκλήρωση αυτής της εργασίας.
(3) Όλες οι πληροφορίες που θα αποκτηθούν θα διατηρηθούν ασφαλείς στους φακέλους και αρχεία που προστατεύονται με κωδικό πρόσβασης και δεν θα διανεμηθούν σε οντότητες εκτός των συνεργατών ΜΕ/ΕΔ, οι οποίοι συμφώνησαν σε αυτή την πολιτική.
(4) Όλες οι σχετικές πληροφορίες θα χρησιμοποιηθούν για τη στατιστική ανάλυση προκειμένου να επιτευχθεί ο σκοπός αυτής της έρευνας και τα αποτελέσματα θα παρουσιαστούν σε επιστημονική/ες δημοσίευση/εις.
(5) Στο τέλος αυτής της έρευνας, κανένας από τους συνεργάτες του ΔΔΔΦ/PNDP-CY δεν θα διατηρήσει κανένα από τα πρωταρχικά δεδομένα που έχουν παράσχει οι συμμετέχοντες.
(6) Όλα τα πρωτογενή δεδομένα θα καταστραφούν, εφόσον έχει ολοκληρωθεί κάθε προβλεπόμενη ανάλυση τους.
(7) Η κοινοποίηση των αποτελεσμάτων της έρευνας στους συμμετέχοντες πραγματοποιείται με πρωτοβουλία των ιδίων συμμετεχόντων, εφόσον το επιθυμούν.
(8) Ως δυνητικός συμμετέχων έχετε το δικαίωμα να λάβετε διευκρινίσεις σχετικά με πιθανές αμφιβολίες που ενδέχεται να έχετε ανά πάσα στιγμή. Μπορείτε να ζητήσετε

λεπτομερέστερες πληροφορίες σχετικά με αυτήν την έρευνα. Για το σκοπό αυτό μπορείτε να επικοινωνήσετε απευθείας με την συντονίστρια που είναι υπεύθυνη για τη μελέτη, τα στοιχεία επικοινωνίας της οποίας αναφέρονται στην αρχή αυτού του εγγράφου. Εφόσον η πολιτική προστασίας προσωπικών δεδομένων της παρούσας μελέτης, όπως αυτή περιγράφεται συνοπτικά στα παραπάνω 8 σημεία, σας βρίσκει σύμφωνο/σύμφωνη, παρακαλώ επιλέξτε το αντίστοιχο πεδίο στην ερώτηση "1" παρέχοντας την συγκατάθεση σας αφού διαβάσετε το κείμενο προσεκτικά μέχρι τώρα.
(9) - Η παρούσα έρευνα έχει εγκριθεί από την ερευνητική επιτροπή του Πανεπιστημίου Λευκωσίας (Αρ. UREC/2021/15).
Το ερωτηματολόγιο θα είναι ανοικτό από 28/11/2022- 30/05/2023 (1η φάση).

Με εκτίμηση,

Ελίνα Πολυδώρου PhD C Διαιτολογίας /Διατροφής του Πανεπιστημίου Λευκωσίας.
Δρ. Ελένη Ανδρέου, Καθηγήτρια Κλινικής Διαιτολογίας/Διατροφής του Πανεπιστημίου Λευκώσιας, Επιβλέπων καθηγήτρια.

* Indicates required question

ΔΔΔΦ/PNDP-CY

.

1

Mark only one oval.

◯ Option 1

2 Με το παρόν δηλώνω ενήμερος/ενήμερη ότι τα δεδομένα που συλλέγονται είναι * ΕΜΠΙΣΤΕΥΤΙΚΑ και θα χρησιμοποιούνται μόνο ανώνυμα για στατιστική ανάλυση και επιστημονική δημοσίευση. *Σημειώστε μόνο μια απάντηση στο αντίστοιχο πεδίο.* Η συμπλήρωση του παρακάτω πεδίου Απαιτείται.

Mark only one oval.

- ◯ "Έχω ενημερωθεί για την πολιτική προστασίας προσωπικών δεδομένων της παρούσας μελέτης και επιτρέπω την χρήση αυτού του ερωτηματολογίου και των απαντήσεων μου για ανώνυμη στατιστική ανάλυση και επιστημονική δημοσίευση.
- ◯ ΔΕΝ επιθυμώ να λάβω μέρος στην παρούσα μελέτη

UNIVERSITY of NICOSIA

Δημογραφικά Στοιχεία

3. Είμαι επαγγελματείας υγείας και συγκεκριμένα διατροφολόγος, διαιτολόγος, κλινικός διαιτολόγος, ή και άλλη εξειδίκευση διαιτολογίας διατροφής. Έχω διαβάσει την πιο πάνω εισαγωγή και επιθυμώ να συμπληρώσω το ερωτηματολόγιο. *

Mark only one oval.

- Ναι, είμα στον κλάδο διαιτολογίας και διατροφής (διατροφολόγος, διαιτολόγος, κλινικός διαιτολόγος) και συμφωνώ να συπληρώσω το ερωτηματολόγιο.
- Όχι, δεν θέλω να συμπληρώσω το ερωτηματολόγιο.

4 Q4 Παρακαλω επισυμάνεται την ηλικιακή σας ομάδα. *

Mark only one oval.

- 22-25 ετών
- 26-30 ετών
- 31-45 ετών
- 46-59 ετών
- 60-66 ετών
- 67 ετών και άνω

5. Q5 Παρακαλω επισυμάνεται την πόλη στην οποία εξασκείτε το επάγγελμα σας. *

Mark only one oval.

- Λευκωσία
- Λεμεσός
- Λάρνακα
- Πάφος
- Αμμόχωστος
- Other:

.   (

6. Q6 Παρακαλω επισυμάνεται εάν εξασκείτε το επάγγελμα σας σε: *

Mark only one oval.

- Χωριό
- Πόλη
- Κωμόπολη
- Other:

7 Q7 Παρακαλώ επισυμάνεται εάν εξασκείτε το επάγγελμά σας σε: *

Mark only one oval.

- Ιδιωτικό γραφείο χωρίς συστέγαση
- Συστέγαση με άλλους επαγγελματίες υγείας, με τους οποίους έχετε συνεργασία
- Συστέγαση με άλλους επαγγελματίες υγείας, με τους οποίους ΔΕΝ έχετε συνεργασία
- Κατοίκων επισκέψεις
- Νοσοκομείο / εξωτερικά ιατρεία

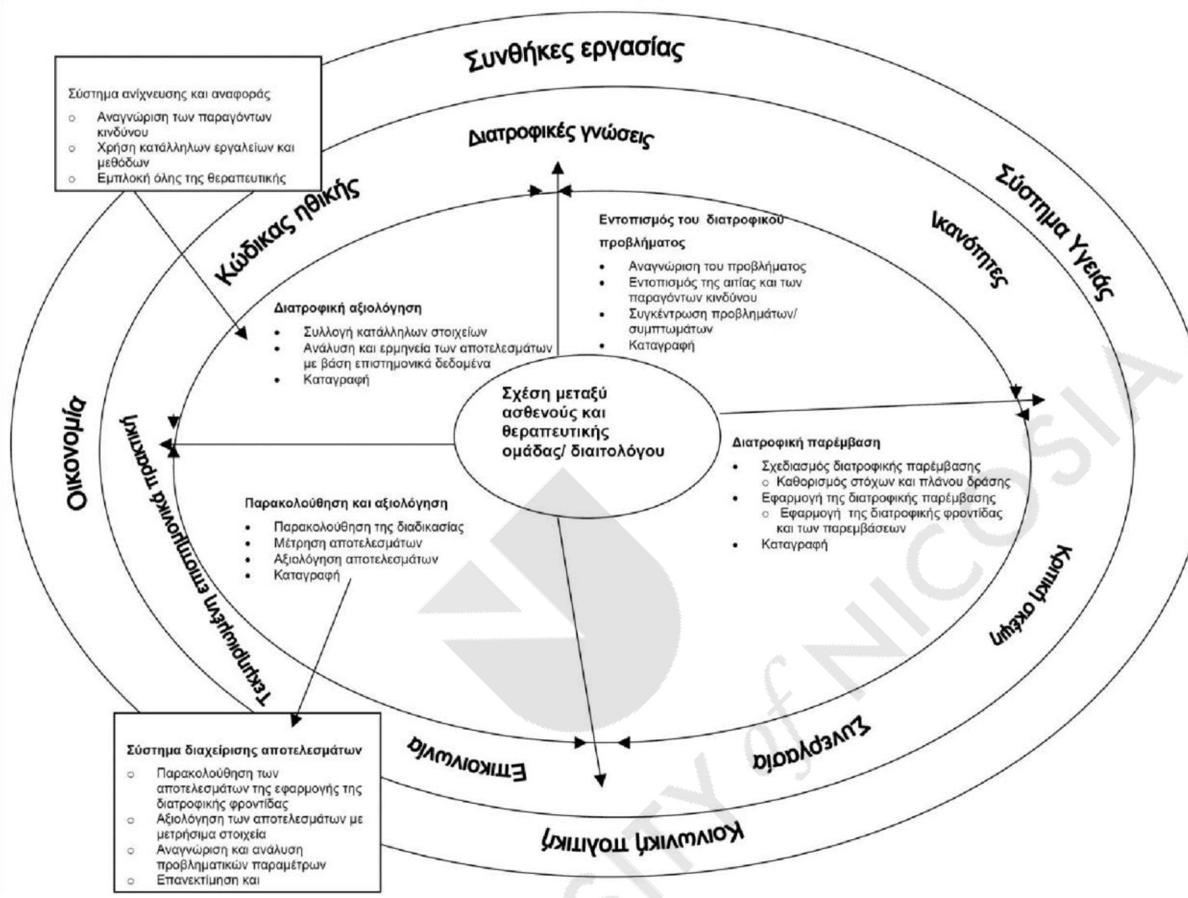
*

8. Q8 Παρακαλώ επισυμένετε για πόσο καιρό (σε μήνες) εξασκείτε αυτό το επάγγελμα

Mark only one oval.

- 1 μήνα
- 2-3 μήνες
- 4-6 μήνες
- 7-24 μήνες
- 25-48 μήνες
- περισσότερο από 2 χρόνια

Διαδικασία τεκμηρίωσης της Διαιτολογικής και Διατροφολογικής Φροντίδας NCP (JADA 2003;103:1061-72) Πρόκειται για ένα μοντέλο που στοχεύει στην περιγραφή της σχέσης ανάμεσα σε όλους τους εμπλεκόμενους παράγοντες με σκοπό την εξασφάλιση της καλύτερης δυνατής ποιότητας στη διαιτολογική και διατροφική φροντίδα.



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ΔΙΑΦΟΡΕΣ ΔΙΑΔΙΚΑΣΙΕΣ ΠΟΥ ΕΦΑΡΜΟΖΟΝΤΑΙ

SOAP	BDAP	ABCDE SP	Κλινική αιτιολόγηση	ΔΔΔΦ
Υποκειμενικά κριτήρια	Κατανόηση/ υπόβαθρο	A, B, C, D, E	Πληροφορίες πρώτης εικόνας	Αξιολόγηση
Αντικειμενικά κριτήρια	Δεδομένα			
Αξιολόγηση	Αξιολόγηση	Περίληψη	Απόφαση θεραπευτικής αγωγής	Διατροφική διάγνωση
Σχέδιο φροντίδας	Σχέδιο φροντίδας	Σχέδιο φροντίδας	Εφαρμογή παρέμβασης Επίτευξη αλλαγών	Σχέδιο παρέμβασης Εφαρμογή παρέμβασης Παρακολούθηση Αξιολόγηση

9. Q9 Γνωρίζεις κάποια από τις πάραπάνω διαδικασίες τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας;

Mark only one oval.

- Ναι
- Όχι

1 . Q1 (

0 0 Εάν απάντησες όχι στην προηγούμενη ερώτησε επέλεξε το πρώτο πεδίο. Εάν απάντησες ναι στην προηγούμενη ερώτηση, τότε από που έχεις ενημερωθεί για την/τις διαδικασία/ες τεκμηρίωσης διαιτηολογικής και διατροφολογικής φροντίδας; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές) *

Tick all that apply.

- [ ] Δεν γνωρίζω κάποια διαδικασία τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας (έχω απαντήσει "όχι" στην προηγούμενη ερώτηση)
- [ ] Από ακαδημαικά - εκπαιδευτικά σεμινάρια ή διαλέξεις του πανεπιστημίου
- [ ] Εκπαιδευτικά προγράμματα του Συνδέσμου Διαιτολόγων και Διατροφολόγων Κύπρου
- [ ] Εκπαιδευτικά προγράμματα από άλλο Σύνδεσμο επαγγελματιών διαιτολογίας και διατροφολογίας της Κύπρου ή/και του εξωτερικού (HCPC, BNF, ADA κ.λπ.)
- [ ] Από συναδέλφους επαγγελματίες διαιτολογίας και διατροφολογίας
- [ ] Μέσα από την πρακτική μου άσκηση κατά την διάρκεια των σπουδών μου σε Πανεπιστήμιο της Κύπρου
- [ ] Μέσα από την πρακτική μου άσκηση κατά την διάρκεια των σπουδών μου σε Πανεπιστήμιο της Ελλάδας
- [ ] Μέσα από την πρακτική μου άσκηση κατά την διάρκεια των σπουδών μου σε Πανεπιστήμιο του εξωτερικού
- [ ] Other: ______________________

1 . Q1 (

11. Q11 Ποια διαδικασία χρησιμοποιείτε για την καταγραφή της διαιτολογικής και διατροφολογικής φροντίδας στην δική σας πρακτική; (π.χ. NCP, SOAP, PNDP) *

Mark only one oval.

- NCP - Nutrition Care Process
- SOAP - Subjective, Objective, Assessment and planning
- PNDP (ΔΔΔΦ) - Process for Nutrition and Dietetic Practice (Διαδικασία Διαιτολογικής και Διατροφολογικής Φροντίδας)
- Γνωρίζω για τις πιο πάνω διαδικασίες, αλλά δεν χρησιμοποιώ κάποια διαδικασία τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας
- Δεν γνωρίζω για την διαδικασία τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας
- Other: ___

1 . Q1 (

2 2 Εφόσον απαντήσατε με "ναι" στην ερώτηση: "Γνωρίζετε κάποια από τις πάραπάνω διαδικασίες τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας;", πως θα χαρακτήριζατε την γνώση σας για μια ή περισσότερες από τις πάραπανω διαδικασίες τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας;
Όπου: 1) πολύ καλή γνώση (δεν χρειάζομαι βοήθεια στην ολοκλήρωση της διαδικασίας), 2) ελάχιστη γνώση (χρειάζομαι βοήθεια στην ολοκλήρωση της διαδικασίας), 3) καμία γνώση (δεν γνωρίζω κάποια από τις διαδικασίες, επομένως μου είναι απαραίτητη η βοήθεια στην ολοκλήρωση της διαδικασίας)

Mark only one oval.

	1	2	3	
Πολ	◯	◯	◯	Καμία γνώση

*

1 . Q1 (

13. Q13 Σε ποιες περιπτώσεις εφαρμόζετε κάποια από τις διαδικασίες τεκμηρίωσης της διαιτολογικής και διατροφολογικής φροντίδας;

Mark only one oval.

- Σε συγκεκριμένα περιστατικά μόνο
- Σε όλα τα περιστατικά
- Δεν χρησιμοποιώ κάποια διαικασία τεκμηρίωσης της διαιτητικής φροντίδας
- Other:

14. Q14 Εάν στην παραπάνω ερώτηση επιλέξατε "Σε συγκεκριμένα περιστατικά μόνο", παρακαλώ διευκρινίστε σε ποια

1 . Q1 (*

5 5 Ολοκληρώνετε όλα τα στάδια της/των διαδικασίας/διαδικασιών τεκμηρίωσης διαιτητικής φροντίδας;

Mark only one oval.

- ( ) Ολοκληρώνω όλα τα στάδια
- ( ) Ολοκληρώνω μόνο σημεία της διδικασίας
- ( ) Δεν χρησιμοποιώ κάποια διαδικασία

*

16. Q16 Παρακαλώ διευκρινίστε ποια στάδια ολοκληρώνετε στην παρακάτω διαδικασία. (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές) *

Tick all that apply.

	Subjective component	Objective component	Assessment component	Plan component	Δεν χρησιμοποιώ αυτή την διαδικασία
SOAP	☐	☐	☐	☐	☐

17. Q17 Παρακαλώ διευκρινίστε ποια στάδια ολοκληρώνετε στην παρακάτω διαδικασία. (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

1 . Q1 (

	Nutrition assessment	Nutrition diagnosis	Nutrition intervention	Nutrition Monitoring and Evaluation	Δεν χρησιμοποιώ αυτή την διαδικασία
NCP	☐	☐	☐	☐	☐

1 . Q1 Π

8 8 αρακαλώ διευκρινίστε ποια στάδια ολοκληρώνετε στην παρακάτω διαδικασία. (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

	Assessment	Identification of Nutrition and Dietetic Diagnosis	Plan Nutrition and Dietetic Intervention	Implement Nutrition and Dietetic Intervention	Monitor and Review	Evaluation	χρ c δι
PNDP	☐	☐	☐	☐	☐	☐	

19. Q19 Ποιο σημείο της διαδικασίας SOAP βρίσκετε ότι είναι το πιο δύσκολο; *

Mark only one oval.

- Subjective component
- Objective component
- Assessment component
- Plan component
- Όλα τα παραπάνω
- Δεν βρίσκω κάποιο από τα παραπάνω σημεία δύσκολο
- Δεν χρησιμοποιώ αυτήν τη διαδικασία, άρα δεν μπορώ να εκφέρω γνώμη

2 . Q2 Π ι *
0 0 οιο σημείο της διαδικασίας NCP βρίσκετε ότι είναι το πιο δύσκολο; *

Mark only one oval.

- ◯ Nutrition Assessment (Διατροφική Αξιολόγηση)
- ◯ Nutrition Diagnosis (Διατροφική Διάγνωση)
- ◯ Nutrition Intervention (Διατροφική Πρέμβαση)
- ◯ Nutrition Monitoring and Evaluation (Διατροφική Παρακολούθηση και Επαναξιολόγηση)
- ◯ Όλα τα παραπάνω
- ◯ Δεν βρίσκω κάποιο από τα παραπάνω σημεία δύσκολο
- ◯ Δεν χρησιμοποιώ αυτήν τη διαδικασία, άρα δεν μπορώ να εκφέρω γνώμη

21. Q21 Ποιο σημείο της διαδικασίας PNDP βρίσκετε ότι είναι το πιο δύσκολο; *

Mark only one oval.

- ◯ Nutrition Assessment
- ◯ Nutrition Diagnosis
- ◯ Nutrition Intervention
- ◯ Nutrition Monitoring and Evaluation
- ◯ Όλα τα παραπάνω
- ◯ Δεν βρίσκω κάποιο από τα παραπάνω σημεία δύσκολο
- ◯ Δεν χρησιμοποιώ αυτήν τη διαδικασία, άρα δεν μπορώ να εκφέρω γνώμη

2 . Q2 Π ι *

2 2 ιστεύεται ότι ο εθνικός σύνδεσμος διαιτολόγων, έχε υποβάλει συστάσεις σχετικά με την χρήση ενός δομημένου τρόπου καταγραφής της διαιτητικής φροντίδας;

Mark only one oval.

- Ναι
- Όχι
- Δεν γνωρίζω

23. Q23 Πιστεύετε ότι πρέπει να υπάρχει μια τυποποιημένη μέθοδος καταγραφής της διαιτητικής φροντίδας; *

Mark only one oval.

- Ναι
- Δεν θεωρώ ότι είναι εφικτό
- Θα μπορούσαν να υπάρχουν συγκρίσιμα στάδια στη διαιτολογική και διατροφολογική φροντίδα
- Δεν το βρίσκω απαραίτητο/χρήσιμο

24. Q24 Γνωρίζατε ότι μια διεθνής διαβούλευση για τη διαδικασία διαιτολογική και διατροφικής φροντίδας διεξάγεται από την Διεθνή Συνομοσπονδία Διαιτητικής Ένωσης; *

Mark only one oval.

- Ναι
- Όχι
- Δεν είμαι σίγουρος/η

Q25 Τυποποιημένη γλώσσα επικοινωνίας (Standardised Language)

25. Q26 Πως αντιλαμβάνεστε την φράση "Τυποποιημένη γλώσσα επικοινωνίας;". *
Θα μπορούσατε να της δώσετε έναν ορισμό;

*

26. Q27 Ποιες από τις πάρα κάτω ομάδες επαγγελματιών διατροφής και διαιτολογίας πιστεύετε ότι θα έπρεπε να υιοθετήσουν μια τυποποιημένη γλώσσα επικοινωνίας; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

- [ ] Επαγγελματίες διατροφής και διαιτολογίας σε νοσοκομεία
- [ ] Επαγγελματίες διατροφής και διαιτολογίας στην πρωτοβάθμια φροντίδα
- [ ] Επαγγελματίες διατροφής και διαιτολογίας στην δημόσια υγεία
- [ ] Επαγγελματίες διατροφής και διαιτολογίας στον τομέα της έρευνας
- [ ] Επαγγελματίες διατροφής και διαιτολογίας που ασχολούντε με την διαχείρηση ή διοίκηση των οργανισμών και συνδέσμων διατροφής και διαιτολογίας
- [ ] Δεν γνωρίζω
- [ ] Όλες οι πιο πάνω ομάδες
- [ ] Other:

2 . Ποι (ι (π ν ι *

7 α είναι η τυποπο ημένη γλώσσα ε ικοι ωνίας που χρησ μοποιείτε ή που θα επιλέγατε να χρησιμοποιήσετε; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

- [ ] Διεθνές Διαιτολογική & Διατροφική Ορολογία / International Dietetics & Nutrition Terminology (IDNT)
- [ ] Διαδικασία Διατροφικής Φροντίδας / Nutrition Care Process (NCP)
- [ ] Υποκειμενικό, Αντικειμενικό, Σχέδιο αξιολόγησης / Subjective, Objective, Assessment, Plan
- [ ] Διαιτολογική & Διατροφική Διαδικασία Φροντίδας / Process for Nutrition and Dietetic Practice (PNDP)
- [ ] Διεθνής Ταξινόμηση Λειτουργίας, Αναπηρίας & Διαιτολογικής Υγείας / International Classification of Functioning, Disability & Health-Dietetics (ICF-D)
- [ ] Συστηματική Ονοματολογία Ιατρικής / Systematized Nomenclature of Medicine (SNOMED)
- [ ] Λογική Παρατήρηση Αναγνωριστικών Ονομάτων και Κωδικών / Logical Observation Identifiers Names & Codes (LOINC)
- [ ] Other: ____________

28. Ποια κατά την γνώμη σας είναι τα πλεονεκτήματα της χρήσης μιας τυποποιημένης γλώσσας επικοινωνίας;

*

*

2 . Ποι ς ι ς π ν ι *

29. Ποια κατά την γνώμη σας είναι τα μειονεκτήματα της χρήσης μιας τυποποιημένης γλώσσας επικοινωνίας;

2 . Ποι (ι (π ν ι *
0 ος θα ήταν/είνα ο καλύτερος τρό ος ια τη ένταξη μ ας τυποποιημένης γλώσσας επικοινωνίας στο κλινικό περιβάλλον; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

- [ ] Η ενημέρωση και συνεχής εκπαίδευση των επαγγελματιών διατροφολογίας και διαιτολογίας
- [ ] Η ένταξη της τυποποιημένης γλώσσας επικοινωνίας στα ηλεκτρονικά αρχεία υγείας
- [ ] Η ένταξη της τυποποιημένης γλώσσας επικοινωνίας ως ένα από τα απαραίτητα στοιχεία της πρακτικής των επαγγελματιών διατροφολογίας και διαιτολογίας σε κλινικό περιβάλλον, από τους EFAD και το Υπουργείο Υγείας.
- [ ] Η πρακτική εφαρμογή μέσω της βιωματικής μάθησης
- [ ] Ο επαρκής χρόνος
- [ ] Η μετάφραση της τυποποιημένης γλώσσας επικοινωνίας
- [ ] Η ένταξη μιας τεκμηριωμένα λειτουργικής τυποποιημένης γλώσσας επικοινωνίας
- [ ] Η ενημέρωση για τα πλεονεκτήματα της χρήσης μιας τυποποιημένης γλώσσας επικοινωνίας
- [ ] Η ευκαιρία για καλύτερη επικοινωνία και συνεργασία με άλλους επαγγελματίες υγείας
- [ ] Η αλλαγή στην δεξιότητα διαχείρησης της διατροφικής φροντίδας
- [ ] Όλα τα παραπάνω
- [ ] Δεν γνωρίζω
- [ ] Other: ____________

3 . Ποι (ι (π γ ν ΄ ιc *

1 ος θα ήταν/είνα ο καλύτερος τρό ος ια τη ένταξη μ ας τυποποιημένης γλώσσας επικοινωνίας στο ακαδημαϊκό περιβάλλον; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

- [ ] Η ένταξη της τυποποιημένης γλώσσας επικοινωνίας στο βασικό πρόγραμμα σπουδών
- [ ] Η εκπαίδευση μια τυποποιημένης γλώσσας επικοινωνίας να αποτελεί βασικό στοιχείο στην εκπαίδευση του επαγγελματία διατροφολογίας και διαιτολογίας από την EFAD και το Υπουργείο Υγείας
- [ ] Η συνεργασία μεταξύ του Ανώτατου Ινστιτούτου εκαπίδευσης και του υπέυθυνου πρακτικής άσκησης
- [ ] Η εκαπαίδευση των εκπαιδευτών πρακτικής άσκησης
- [ ] Η βιωματική μάθηση
- [ ] Η χρήση συστήματος στον υπολογιστή
- [ ] Μέσω ευκαιριών δικτύωσης
- [ ] Η μετάφραση της τυποποιημένης γλώσσας επικοινωνίας και συνεπώς η διαθεσιμότητα της στην Ελληνική γλώσσα
- [ ] Η ευκαιρία για καλύτερη επικοινωνία και συνεργασία με άλλους επαγγελματίες υγείας
- [ ] Η χρηματοδότηση για έρευνα
- [ ] Η ενημέρωση μέσα από επιστημονικά συνέδρια ή επιστημονικά περιοδικά
- [ ] Όλα τα παραπάνω
- [ ] Δεν γνωρίζω
- [ ] Other: ____________________

32. Πόσος χρόνος θα χρειαστεί για την εφαρμογή μιας τυποποιημένης γλώσσας επικοινωνίας κατά την άποψη σας; Παρακαλώ απαντήστε σε μήνες. *

____

33. Μπορείτε να καθορίσετε σε ποιο περιβάλλον θα μπορούσε να είναι χρήσιμη η τυποποιημένη γλώσσα επικοινωνίας; *

____

3 . *

4 Η χρήση μιας τυποποιημένης γλώσσας επικοινω ίας έχει αλλάξει ή θα αλλάξει την αντίληψη των συναδέλφων ή άλλων επαγγελματιών υγείας όσον αφορά το επάγγελμα μας;

Mark only one oval.

- Ναι
- Όχι
- Δεν γνωρίζω

35. Η χρήση μιας τυποποιημένης γλώσσας επικοινωνίας θα βελτιώσει την ικανότητα ελέγχου της φροντίδας, θα διευκολύνει στην πραγαματοποίηση μιας πιο επιστημονικής προσέγγισης, στην βελτίωση της ποιότητας της φροντίδας και του αποτελέσματος των υπηρεσιών που προσφέρουν οι εγγεγραμμένοι / επαγγελματίες της διαιτολογίας, διατροφολογίας και οι σχετικές ειδικότητες; *

Mark only one oval.

- Ναι
- Όχι
- Δεν γνωρίζω

37. Είναι ή ήταν κάποια τυποποιημένη γλώσσα επικοινωνίας μέρος της πρακτικής σας άσκησης; Εαν ναι, ποια; *

*

36. Ποιο πιστεύετε ότι είναι το κύριο μέλημα κατά την επιλογή ενός συστήματος τυποποιημένης γλώσσας επικοινωνίας; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές) *
*

Tick all that apply.

- [ ] Το σύστημα υγείας
- [ ] Ο χρόνος, η εκπαίδευση, η οικονομία
- [ ] Το σύστημα εκπαίδευσης
- [ ] Η τυποποιημένη γλώσσα επικοινωνίας που χρησιμοποιείται από τους υπόλοιπους επαγγελματίες υγείας
- [ ] Τα νομικά και πολιτικά ζητήματα
- [ ] Η εξέληση της διαιτολογίας και διατροφολογίας αναχρονιστικά
- [ ] Ζητήματα που αφορούν την γλώσσα
- [ ] Τα πλεονεκτήματα που θα αποκτηθούν
- [ ] Όλα τα παραπάνω
- [ ] Other: ______________________

3 . *

38. Διδάσκεται κάποια τυποποιημένη γλώσσα επικοινωνίας στην ακαδημαϊκή εκπαίδευση ή στο πρόγραμμα σπουδών;

Mark only one oval.

- Ναι
- Όχι
- Δεν γνωρίζω

39. Ποια τυποποιημένη γλώσσα επικοινωνίας πρέπει να διδάσκεται στο κάθε περιβάλλον;

40. Πιστεύετε ότι ο Σύνδεσμος Διαιτολόγων και Διατροφολόγων Κύπρου (Συ.Δι.Κυ), προωθεί συγκεκριμένη τυποποιημένη γλώσσα επικοινωνίας; Εαν ναι, τότε ποια; *

41. Τι πιστεύετε ότι χρειάζεται βελτίωση στις παρόν τυποποιημένες γλώσσες επικοινωνίας; *

3 . *

2 Πιστεύετε ότι η ιατρική διάγνωση είν ι η ίδια με την διατροφική διάγνωση; *

Mark only one oval.

- Ναι
- Όχι
- Μερικές φορές
- Δεν ξέρω
- Other:

43. Ποια από τις παρακάτω διαγνώσεις αποτελεί διατροφική διάγνωση *

Mark only one oval.

- Ύποθυρεοειδισμός, μη καθορισμένος
- Γαστρο-οισοφαγική παλλινδρόμηση
- Απώλεια βάρους
- Αρτηριακή Υπέρταση
- Καμία από τις παραπάνω

*

4 Μπορείτε να διακρίνετε ποια από τα π ρακάτω είναι στοιχεία του ΔΔΔΦ; (Μπορείτε να επιλέξετε περισσότερες από μια επιλογές)

Tick all that apply.

- [ ] Ανθρωπομετρική αξιολόγηση
- [ ] Ιατρικό ιστορικό και κλινικά συμπτώματα
- [ ] Βιοχημικές αναλύσεις
- [ ] Ιατρικές εξετάσεις
- [ ] Ημερολόγιο καταγραφής τροφίμων ή συνέντευξη 24ωρης ανάκλησης
- [ ] Διατροφικοί στόχοι
- [ ] Διατροφικό Πλάνο
- [ ] Διατροφική Παρέμβαση
- [ ] Επαναξιολόγηση και Παρακολούθηση
- [ ] Όλα τα παραπάνω
- [ ] Κανένα από τα παραπάνω

45. Έχετε χρησιμοποιήσει στο παρελθόν το ΔΔΔΦ αλλά όχι πλέον; *

Mark only one oval.

- Ναι
- Όχι
- Δεν θυμάμαι

*

7 Εάν στην πιο πάνω ερώτηση έχετε απ ντήσει "Ναι παρουσιάζει δυσκολίες στην εφαρμογή", παρακαλώ δώστε μερικά παραδείγματα.

46. Εάν χρησιμοποιείτε ή έχετε χρησιμοποιείσει στο παρελθόν την ΔΔΔΦ, παρακαλώ επισυμάνετε εάν πιστεύετε ότι η ΔΔΔΦ παρουσιάζει δυσκολίες στην εφαρμογή.

Mark only one oval.

- Ναι παρουσιάζει δυσκολίες στην εφαρμογή
- Όχι δεν παρουσιάζει δυσκολίες στην εφαρμογή
- Δεν την έχω χρησιμοποιείσει και ούτε την χρησιμοποιώ
- Other: ___

48. Εάν επιθυμείτε να ενημερωθείτε για την 2η φάση της έρευνας, με σκοπό να συμμετέχετε σε αυτή, παρακαλώ σημειώστε το email σας ή τον αριθμό τηλεφώνου σας. Διαφορετικά σημειώσετε "Δεν ενδιαφέρομαι". Σας υπενθυμίζεται πως εαν ΔΕΝ συμπληρώσετε το email ή τον αριθμό του τηλεφώνου σας, τότε οι απαντήσεις σας θα παραμείνουν ανώνυμες και θα επεξεργαστούν σύμφωνα με τον κώδικα βιοηθικές όπως αναφέρεται και στην αρχή του ερωτηματολογίου. *

Appendix IV: Validation Questionnaire

Αξιολόγηση εγκυρότητας του ηλεκτρονικού εργαλείου Διαιτολογικής και Διατροφικής Διαδικασίας Φροντίδας (e-ΔΔΔΦ).

Ενημερωτική Επιστολή Συμμετοχής
σε Ερευνητική Μελέτη

Αγαπητές/οί συμμετέχοντες,

Καλείστε να λάβετε μέρος εθελοντικά σε μία ερευνητική μελέτη που αποτελεί μέρος της διδακτορικής μου διατριβής στην Κλινική Διαιτολογία του Πανεπιστημίου Λευκωσίας. Σας παρακαλούμε να αφιερώσετε 5 λεπτά από τον χρόνο σας για να απαντήσετε σε ένα σύντομο ερωτηματολόγιο. Οι απαντήσεις σας θα παραμείνουν ανώνυμες εάν εσείς το επιθυμείτε και όλα τα δεδομένα θα αποθηκευτούν και θα χρησιμοποιηθούν αποκλειστικά για τους σκοπούς της έρευνας, σύμφωνα με τις εγκεκριμένες διαδικασίες του Πανεπιστημίου Λευκωσίας και τον Κανονισμό Προστασίας Προσωπικών Δεδομένων της Ευρωπαϊκής Ένωσης (ΕΕ) 2016/679. Η παρουσα ερευνα εχει εγκριθει απο το UREC με άριθμο πρωτοκολου UREC/2021/15.

Το παρόν ερωτηματολόγιο έχει σκοπό να προσεγγίσει επαγγελματίες διατροφής και διαιτολογίας (διατροφολόγους, διαιτολόγους, κλινικούς διαιτολόγους) της Κύπρου ή/και του εξωτερικού, ώστε να εκτιμηθεί η εγκυρότητα του εργαλείου που δημιουργήθηκε ως μέρος της διατριβής. Το εργαλείο αφορά την ηλεκτρονική και μεταφρασμένη μορφή του πρωτότυπου μοντέλου Διατροφικής και Διαιτολογικής Διαδικασίας Φροντίδας (ΔΔΔΦ). Η συμμετοχή σας είναι σημαντική και πολύτιμη για την προώθηση περαιτέρω ερευνών στο θέμα, με στόχο τη βελτίωση της ποιότητας του επαγγέλματός μας.

Σκοπός του ερωτηματολογίου είναι:

(α) η συνολική ή/και τμηματική αξιολόγηση του ηλεκτρονικού εργαλείου καταγραφής της διαιτολογικής και διατροφικής διαδικασίας φροντίδας (e-ΔΔΔΦ),

(β) η εκτίμηση της εφαρμοσιμότητας του εργαλείου e-ΔΔΔΦ από πιστοποιημένους επαγγελματίες διατροφής και διαιτολογίας στην Κύπρο (διατροφολόγους, διαιτολόγους, κλινικούς διαιτολόγους).

Υπεύθυνοι για την παρούσα έρευνα είναι:

- Ελίνα Πολυδώρου, RD, RNutr, BSc, MSc (e.polydorou@outlook.com)

- Καθ. Δρ. Ελένη Ανδρέου, CPD, RDN, LD, DProf., FHEA (επιβλέπουσα καθηγήτρια, andreou.el@unic.ac.cy)

- Επιβλέπουσα ομάδα (Prof Eleni Andreou(1st), Stella Nicolaou (2nd), Prof Antonis Zampelas (3rd)

Για τη συμμετοχή σας στη μελέτη, πρέπει να ενημερωθείτε και να παρέχετε τη συγκατάθεσή σας σχετικά με την καθορισμένη πολιτική προστασίας προσωπικών δεδομένων. Στο πλαίσιο αυτό, θα θέλαμε να σας ενημερώσουμε για τα εξής:

1. Οι υπεύθυνοι ερευνητές αναλαμβάνουν την ευθύνη για τη συλλογή και στατιστική ανάλυση των πληροφοριών που παρέχετε για τις ανάγκες του ερευνητικού έργου.

2. Η συμμετοχή σας είναι ανώνυμη, εφόσον το επιλέξετε. Σε περίπτωση που επιθυμείτε να συμμετάσχετε σε επόμενο στάδιο της έρευνας, παρακαλούμε όπως αφήσετε τα στοιχεία επικοινωνίας σας στο αντίστοιχο πεδίο του ερωτηματολογίου.

3. Όλες οι πληροφορίες που θα αποκτηθούν θα χρησιμοποιηθούν αποκλειστικά για τους σκοπούς της μελέτης.

4. Η κοινοποίηση των αποτελεσμάτων της έρευνας στους συμμετέχοντες πραγματοποιείται με πρωτοβουλία των ίδιων, εφόσον το επιθυμούν και αποταθούν στους υπεύθυνους της έρευνας.

5. Ως δυνητικός συμμετέχων, έχετε το δικαίωμα να λάβετε διευκρινίσεις σχετικά με πιθανές απορίες ανά πάσα στιγμή. Μπορείτε να ζητήσετε περισσότερες πληροφορίες για την έρευνα επικοινωνώντας απευθείας με την υπεύθυνη ερευνήτρια στα στοιχεία που αναφέρονται παραπάνω.

6. Για τυχόν παράπονα, μπορείτε να απευθυνθείτε στο αρμόδιο άτομο: Στέλλα Μανώλη (manoli.s@unic.ac.cy). Το άτομο αυτό είναι ανεξάρτητο από την έρευνα και δεν αποτελεί μέλος της ερευνητικής ομάδας.

Σας ευχαριστούμε θερμά για τον χρόνο και την πολύτιμη συμμετοχή σας στην έρευνά μας!

Με εκτίμηση,

Ελίνα Πολυδώρου, PhD (C)

BSc Nutritional Sciences, MSc Clinical Dietetics

Υποψήφια Διδάκτορας, Πανεπιστήμιο Λευκωσίας

Καθ. Δρ. Ελένη Ανδρέου, CPD, RDN, LD, DProf., FHEA

Επιβλέπουσα Καθηγήτρια

* Indicates required question

Οδηγίες Ερωτηματολογίου και Συγκατάθεση συμμετοχής

Για την συμμετοχή σας σε αυτό το ερωτηματολόγιο, δεν καλείστε να χρησιμοποιήσετε το ηλεκτρονικο εργαλείο που θα σας παρουσιαστεί στα επόμενα σημεία. Καλείστε να βαθμόλογήσετε αυτό που σας απεικονίζεται με βάση τους παράγοντες "Σχετικότητα/Relevance", "Σαφήνεια/Clarity", "Απλότητα/Simplicity".
Τα πάρακάτω κριτήρια αφορούν συγκεκριμένα την σελίδα που σας προβάλετε ανά ερώτημα.

- "Σχετικότητα/Relevance" - Κάθε σημείο του εργαλείου (της παρούσας προβολής) υποστηρίζει άμεσα το επιθυμητό αποτέλεσμα. Περιλαμβάνει μόνο τα απαραίτητα στοιχεία και δεν συλλέγει ή διαθέτει περιττά σημεία ή λεπτομέρειες.
- "Σαφήνεια/Clarity" - Η διατύπωση, η παρουσίαση και οι οδηγίες του εργαλείου είναι ξεκάθαρες, χωρίς αμφισημίες.
- "Απλότητα/Simplicity" - Η διαδικασία είναι εύκολη και κατανοητή και μπορεί να συμπληρωθεί χωρίς δυσκολία.

.

Η βαθμολογία που καλείστε να δώσετε κειμένεται από 1 μέχρι 5. Παρακαλώ όπως συμβουλευτείτε τον πίνακα που επισυνάπτεται.

Κριτήριο / Criterion	1	2	3	4	5
Σχετικότητα / Relevance	Μη σχετική	Λίγο σχετική	Μέτρια σχετική	Πολύ σχετική	Εξαιρετικά σχετική
Σαφήνεια / Clarity	Ασαφές	Χρήζει ελάχιστης επαναδιατύπωσης	Ουδέτερο	Πολύ σαφές	Εξαιρετικά σαφές
Απλότητα / Simplicity	Πολύ περίπλοκο	Ελαφρώς περίπλοκο	Ουδέτερο	Πολύ απλό	Εξαιρετικά απλό

1. Παρακαλώ όπως δηλώσετε εάν συγκατατίθεστε να συμμετάσχετε στην έρευνα. *

   Mark only one oval.

   ◯ Ναι *Skip to question 2*

   ◯ Όχι

Συμπερίληψη στις "ευχαριστίες" της εν λόγω δημοσίευσης.

2 Ως μέλος της ομάδας εμπειρογνωμόνων, θα επιθυμούσα το όνομα μου να αναφερθεί στις "ευχαριστίες" της εν λόγω δημοσίευσης. *

   Mark only one oval.

   ◯ Ναι

   ◯ Όχι *Skip to question 4*

3. Εφόσον απαντήσατε "Ναι" στην προηγούμενη ερώτηση, παρακαλώ δηλώστε το όνομα, το email σας και τον τίτλο με τον οποίο επιθυμείτε να αναφερθείτε.

   ____

ΕΞΩΦΥΛΛΟ

ΔΙΑΔΙΚΑΣΙΑ ΔΙΑΤΡΟΦΙΚΗΣ ΚΑΙ ΔΙΑΙΤΟΛΟΓΙΚΗΣ ΦΡΟΝΤΙΔΑΣ

Από την Ελίνα Πολυδώρου και επιβλέπων καθηγήτρια Prof. Ελένη Ανδρέου

Μέρος της διδακτώρική διατριβής με τίτλο:

Comparison of the Standardised Nutrition Terminology in a software or manual format and presentation of their impact to the Nutrition Care Process. An Observational cross-sectional study.

υπό την αιγίδα του Συνδέσμου Διαιτολόγων & Διατροφολόγων Κύπρου

Την πρώτη φορά που θα χρησιμοποιήσετε αυτό το εργαλείο, θα σας ζητηθεί να εξουσιοδοτήσετε πρόσβαση στον δημιουργό (elinapdr@gmail.com). Ο δημιουργός δεν μπορεί να δει, διαβάσει ή επεξεργαστεί τις προσωπικές σας πληροφορίες. Η προσβαση απαιτείται αποκλειστικά για την λειτουργία των αυτόνομων δημιουργιών της περίληψης σε κάθε πεδίο, έπειτα από το πάτημα στα αντίστοιχα κουμπιά.

4. **Σχετικότητα/Relevance** *

   1. Μη σχετική
   2. Λίγο σχετική
   3. Μέτρια σχετική
   4. Πολύ σχετική
   5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

5 **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

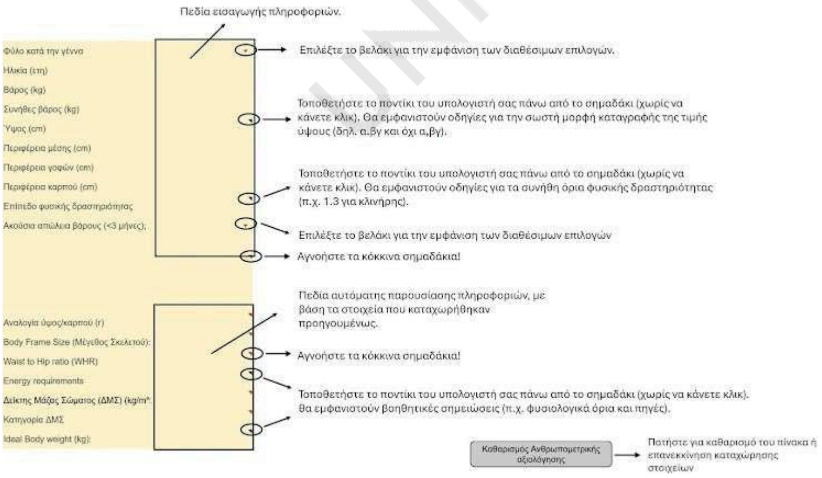
6. **Απλότητα/Simplicity** *

1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

7. Σχόλια

ΑΝΘΡΩΠΟΜΕΤΡΙΚΗ ΑΞΙΟΛΟΓΗΣΗ



8 **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1 2 3 4 5

☆ ☆ ☆ ☆ ☆

9. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1 2 3 4 5

☆ ☆ ☆ ☆ ☆

10. **Απλότητα/Simplicity** *

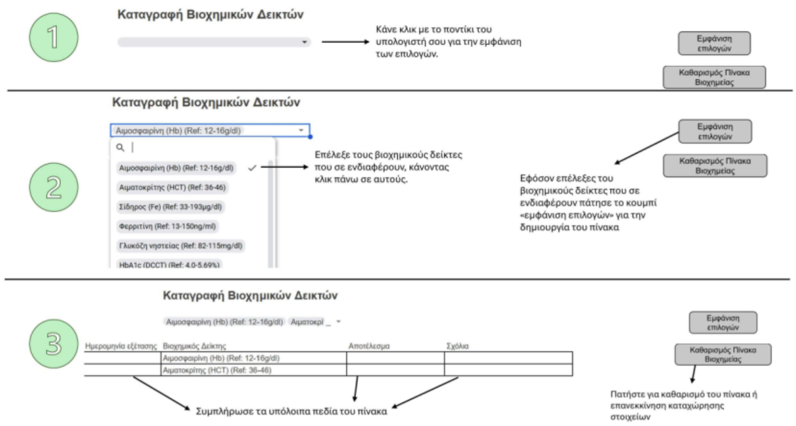
1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1 2 3 4 5

☆ ☆ ☆ ☆ ☆

11. Σχόλια

ΚΑΤΑΓΡΑΦΗ ΒΙΟΧΗΜΙΚΩΝ ΔΕΙΚΤΩΝ



12. **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

13. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

14. **Απλότητα/Simplicity** *

1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

15. Σχόλια

ΣΥΛΛΟΓΗ ΙΑΤΡΙΚΟΥ ΙΣΤΟΡΙΚΟΥ

16. **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

17. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

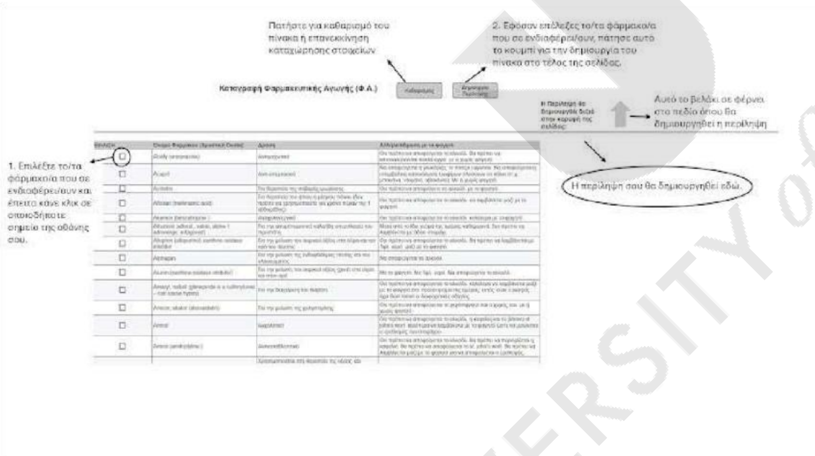
19. Σχόλια /

18. **Απλότητα/Simplicity** *

1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

ΚΑΤΑΓΡΑΦΗ ΙΣΤΟΡΙΚΟΥ ΦΑΡΜΑΚΕΥΤΙΚΗΣ ΑΓΩΓΗΣ



20. **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

2 . ʹ /

21. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

2 **Απλότητα Simplicity** *

1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

23. Σχόλια

ΣΥΝΘΕΣΗ ΔΙΑΙΤΟΛΟΓΙΚΗΣ ΚΑΙ ΔΙΑΤΡΟΦΙΚΗΣ ΔΙΑΓΝΩΣΗΣ

2 . ' /

24. **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

25. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

2 . ʹ /

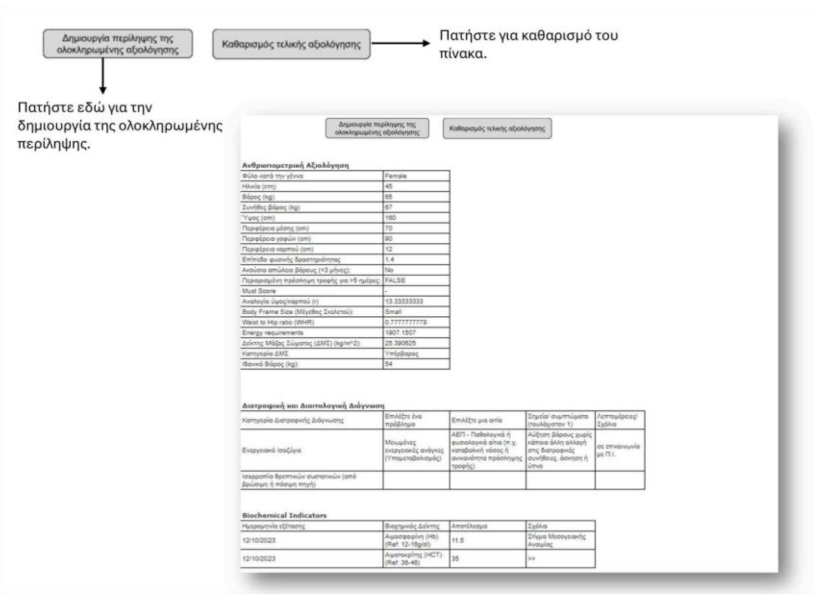
6 **Απλότητα Simplicity** *

1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

27. Σχόλια

ΟΛΟΚΛΗΡΩΜΕΝΗ ΠΕΡΙΛΗΨΗ ΣΗΜΕΙΩΣΕΩΝ



28. **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

9 **Σαφήνεια Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

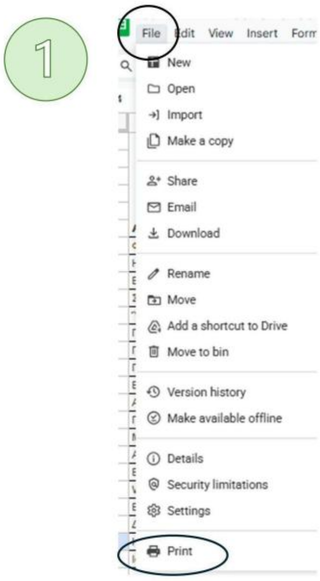
30. **Απλότητα/Simplicity** *

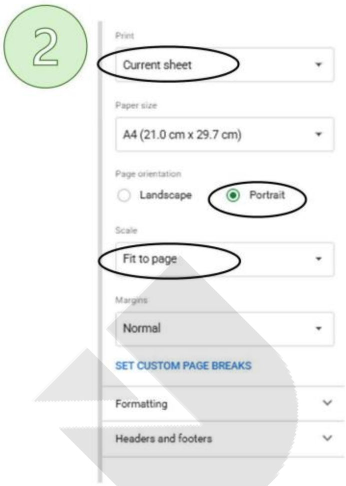
1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

31. Σχόλια

ΕΚΤΥΠΩΣΗ / ΑΠΟΘΗΚΕΥΣΗ ΠΕΡΙΛΗΨΗΣ





32 **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

33. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

34. **Απλότητα/Simplicity** *

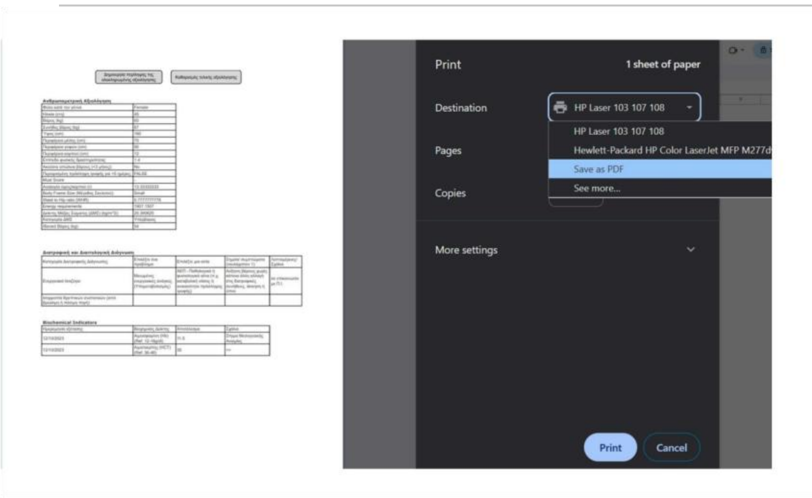
1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

35. Σχόλια

ΕΚΤΥΠΩΣΗ Ή ΑΠΟΘΗΚΕΥΣΗ ΠΕΡΙΛΗΨΗΣ

39. Σχόλια /



36. **Σχετικότητα/Relevance** *

1. Μη σχετική
2. Λίγο σχετική
3. Μέτρια σχετική
4. Πολύ σχετική
5. Εξαιρετικά σχετική

1	2	3	4	5
☆	☆	☆	☆	☆

37. **Σαφήνεια/Clarity** *

1. Ασαφές
2. Χρήζει ελάχιστης επαναδιατύπωσης
3. Ουδέτερο
4. Πολύ σαφές
5. Εξαιρετικά σαφές

1	2	3	4	5
☆	☆	☆	☆	☆

38. **Απλότητα/Simplicity** *

1. Πολύ περίπλοκο
2. Ελαφρώς πολύπλοκο
3. Ουδέτερο
4. Πολύ απλό
5. Εξαιρετικά απλό

1	2	3	4	5
☆	☆	☆	☆	☆

Ευχαριστούμε για την πολύτιμη συμμετοχή σας!

Με εκτίμηση,

Η Επιστημονική Ομάδα

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Google Forms

Appendix V: UREC approval form

UNIVERSITY of NICOSIA

UREC (University Research Ethics Committee) Evaluation Form		
Application Details	Application reference number	UREC/2021/15
	Principal investigator/student name	Elina Polydorou
	Research project/thesis title	Comparison of the Standardized Nutrition Terminology in a software or manual format and presentation of their impact to the Nutrition Care Process. An
	School	Engineering and Sciences
	Department	Life and Health Sciences
	Evaluation Date	18-Nov-21

Evaluation Comments

The University Research Ethics Committee has reviewed the application. Based on the information provided, the Committee has decided to approve the application.

Please note that along with UREC's approval it is the applicant's responsibility to obtain/comply with the required licenses, legislation and ethical considerations of the local authorities of the national context in which the research is taking place.

Please note that any modifications in the methodology and/or research procedures would require further evaluation of the proposed research by UREC.

Result of the Evaluation	
APPROVED	✓
CONDITIONALLY APPROVED (address the above comments/suggestions and resubmit)	
NOT APPROVED (submit a new application)	
REDIRECT (to an alternative ethics committee)	

UREC Chair (on behalf of UREC)	Name: Leonidas Efthymiou Signature: Leonidas Efthymiou Digitally signed by Leonidas Efthymiou Date: 2021.11.18 20:35:47 +02'00'	Date: 18-Nov-21

<u>UREC Members</u>

Dr Costas Constantinou, Medical School
Dr Leonidas Efthymiou, School of Business
Dr Christina Hadjisoteriou, School of Education
Dr Stella Nicolaou, School of Sciences & Engineering
Dr Ioulia Papageorgi, School of Humanities and Social Sciences
Dr George Tsaousis, School of Law

Office of the Vice Rector for Faculty & Research
vrfr.office@unic.ac.cy

UREC Evaluation

Appendix VI: Acceptance of Research Study Under the Auspices of CyDNA

ΣΥΝΔΕΣΜΟΣ ΔΙΑΙΤΟΛΟΓΩΝ & ΔΙΑΤΡΟΦΟΛΟΓΩΝ ΚΥΠΡΟΥ

Αρ. Φακ.:5.2.23

CYPRUS DIETETIC & NUTRITION ASSOCIATION (CyDNA)

Subject: Acceptance of Research Study Under the Auspices of CyDNA

The Cyprus Dietetic and Nutrition Association (CyDNA) is pleased to formally acknowledge and support the doctoral research study titled:

"Comparison of the Standardised Nutrition Terminology in a Software or Manual Format and Presentation of

Their Impact to the Nutrition Care Process: An Observational Cross-Sectional Study with a Focus Group"

conducted by Elina Polydorou, PhD Candidate, University of Nicosia, Department of Life and Health Sciences.

After careful consideration of the study's aims, scientific contribution, and its relevance to the dietetic profession in Cyprus, the CyDNA Board hereby grants its official endorsement and agrees to place this research under its auspices.

This recognition is granted under the following conditions:

1. The research adheres to ethical standards and has received approval from the University of Nicosia's ethics committee.
2. The use of the CyDNA name and logo will be limited to presentations, publications, or dissemination explicitly related to this project.
3. A final version of the thesis will be shared with CyDNA upon completion.
4. Any derived recommendations impacting professional practice or policy in Cyprus will be shared with CyDNA in advance for consultation.

We wish Ms. Polydorou continued success with her research and look forward to its outcomes, which are expected to contribute significantly to the advancement of clinical dietetic documentation and practice in Cyprus.

For and on behalf of the

Cyprus Dietetic and Nutrition Association

Eleni P Andreou

Dr Eleni Andreou, RDN, LD
President

AnnaPahita

Anna Pahita,SRD
Secretary

Πρόεδρος: Ελένη Π. Ανδρέου, **Αντιπρόεδρος**: Χριστιάνα Φιλίππου, **Γραμματέας**: Άννα Παχιτα, **Ταμίας**: Δημήτρης Παπαμιχαήλ **Βοηθός Γραμματέα**: Νικολέττα Ντορζή, **Μέλη** Νίκος Νταφλος, Ανδρέας Σάββα

Ταχ. Διεύθυνση: Τ.Θ. 28823, Τ.Τ. 2083 Λευκωσία, Κύπρος / Τηλ: 22452258- Fax: 22-452292, info@cydadiet.org

Appendix VII: CyDNA 13th Conference Abstract publication

OP 002

NUTRITION DOCUMENTATION PROCESS AND STANDARDISED LANGUAGE, WHAT CAN BE IMPROVED? AN OBSERVATIONAL CROSS-SECTIONAL STUDY

Hina Polydorou, and Eleni Andreou [12]
" Department of Life Sciences, School of Life and Health Sciences, University of Nicosia, Cyprus.; polydorou.e3@live.unic.ac.cy (E. P.); andreou.el@unic.ac.cy (EA.);
[2] Cyprus Dietetic and Nutrition Association, Nicosia, Cyprus
Presenting author: polydorou.e3@/ive.unic.ac.cy (E. P.)

Background
Nutrition documentation processes (DPs) and standardised languages (SLs) are powerful tools, that are often ignored or misused by nutrition and dietetic professionals (NDPs) (Lövestam et al., 201 5; Regan et al., 2009). Understanding NDPs' perception about DP/SL, is critical for their improvement to meet their professionals needs.

Objective
The study questions whether an updated DP/SL, tailored to the NDPs needs could lead to their increased implementation. Understanding of current DP/SL implementation status and exploration of NDPs' perceptions and implementation factors is critical for establishing targeted aspects to improve. Therefore, the study aims to mitigate identified barriers to the extent feasible for the research team.

Methodology
The study has an observational cross-sectional design. Data were anonymously collected from 63 NDPs, via an online questionnaire. The Chi-Square test of independence (Fisher's exact with Monte Carlo simulation), the Creamer's V test of strength of association and the Uncertainty Coefficient, directional measure of association were used for the statistical analysis, using SPSS.

Results

The Process for Nutrition and Dietetic Practice (PNDP) was the most preferable DP (41.27%, n=26). Improved communication amongst health care professionals and the ability to facilitate a structured and consistent care plan, were the most acknowledged advantages of DP/SL, by 73% (n=46) and 31 .7% (n=20) of participants respectively. Documentation processes and SLs are believed to be time-intensive by 33.3% (n=21) of the participants, while 14.3% (n=9) report no disadvantages. Finally, 63.49% (n=40) agree that DP/SL has or could lead to an improved patient outcome and to a greater appreciation of the NDP's by other HCPs.

Conclusion

Although DP/SL is a useful tool and its advantages are well recognised among NDPs, its drawbacks seem to hold greater magnitude when it comes to its implementation. Therefore, finding solutions and methods to improve DPs/SLs to better fit NDPs needs are important.

Keywords

Dietetic documentation; standardised terminology; SL benefits; SL drawbacks; improvements in SLs

References

Lövestam, E., Orrevall, Y., Koochek, A., Karlström, B., & Andersson, A. (2015). Evaluation of Nutrition Care Process documentation

in electronic patient records: Need of improvement. Nutrition & Dietetics, 72(1), 74–80. 10.1111/1747-0080.12128

Regan, T., Maillet, J. 0., Touger-Decker, R, Khan, H., Byham-Gray, L., Rigassio Radler, D., & Brody, R. (2009). Knowledge, Perceptions and Practices of Registered Dietitians in the Dietetic Practice Group, Consultant Dietitians in Health Care Facilities, Regarding the American Dietetic Association's Standardized Language to Document the Nutrition Care Process. Journal of the American Dietetic Association, 109(9), Al O. 10.1016/j.jada.2009.06.Ol O

Appendix VIII: PROSEPRO certificate

NIHR | National Institute for Health and Care Research

PROSPERO

International prospective register of systematic reviews

Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings.

Eleni Andreou, Elina Polydorou

Citation

Eleni Andreou, Elina Polydorou. Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings.. PROSPERO 2026 CRD420261279775. Available from https://www.crd.york.ac.uk/PROSPERO/view/CRD420261279775.

REVIEW TITLE AND BASIC DETAILS

Review title

Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings.

Condition or domain being studied

Nutrition Care; Nutrition education; Nutrition Therapy; Nutrition Care Assessment

P: Dietitians, Healthcare professionals

I: Nutrition Care Process, Electronic Health Records

C: Manual documentation, No NCP use

O: Implementation rate, Documentation quality, Practitioner confidence

Rationale for the review

The Nutrition Care Process (NCP) is a standardised framework developed to enhance the quality, consistency, and effectiveness of nutrition care provided by dietitians. Despite its widespread endorsement by professional bodies such as the Academy of Nutrition and Dietetics and the International Confederation of Dietetic Associations, the implementation of NCP and its terminology (NCPT) remains inconsistent across countries and clinical settings. Emerging evidence suggests that technological infrastructure, professional training, and institutional support play significant roles in the uptake of the NCP, particularly when comparing manual (paper-based) documentation to electronic formats integrated into Electronic Health Records (EHRs).

This review aims to systematically examine international trends in the implementation of the NCP, identify key barriers and enablers, and compare outcomes between manual and softwarebased application formats. By synthesising observational and qualitative data across diverse settings, the review will offer insight into how context-specific factors—such as national policy, peer support, and training—affect adoption and practice outcomes.

The findings will inform future research and policy efforts, offering recommendations for improving clinical workflow, documentation quality, and patient care through strategic NCP integration. This review will contribute a critical global perspective to a topic that is often addressed only at the national or institutional level.

Review objectives

The objective of this systematic review is to evaluate the implementation of the Nutrition Care Process (NCP) and its terminology (NCPT) across international dietetic settings. Specifically, it aims to:

Identify and synthesise evidence on the current use of the NCP/NCPT in manual (handwritten or typed) and electronic (software-based or EHR-integrated) formats.

Compare the outcomes associated with each format, including time efficiency, quality of documentation, professional confidence, and perceived impact on patient care.

Examine the key factors influencing implementation, such as access to technology, peer support, professional training, and recommendations from national dietetic associations.

Highlight cross-country differences and context-specific challenges or enablers to adoption.

The review will include observational, cross-sectional, cohort, mixed-methods, and qualitative studies that focus on registered dietitians or accredited nutrition professionals in clinical, public health, or academic settings. This review seeks to answer:

What are the global trends in NCP/NCPT implementation?

How do manual and software-based formats compare in terms of usability and outcomes?

What are the common barriers and enablers to successful adoption of the NCP in practice?

Keywords

Clinical Nutrition; Medical Nutrition Therapy; Health education; Nutrition care, nutrition education

Country

Cyprus

ELIGIBILITY CRITERIA

Population

Included

Population Inclusion Criteria:

Registered dietitians, licensed nutritionists, or accredited nutrition professionals.

Practising in clinical, public health, academic, or institutional settings.

Studies involving professionals from countries with or without formal registration systems (e.g., national associations or regulatory bodies).

Participants involved in implementing or evaluating the Nutrition Care Process (NCP) or related documentation processes (manual or electronic).

Studies involving professionals working individually or within multidisciplinary teams.

Excluded

Population Exclusion Criteria:

Students or interns not yet qualified as dietitians or nutrition professionals.

Non-healthcare populations (e.g., patients, administrators, or the general public).

Studies involving other healthcare professionals (e.g., nurses, physicians) unless dietitians were the main focus.

Animal studies or experimental models not involving human professionals.

Populations using non-standardised or unofficial documentation systems unrelated to the NCP.

Intervention(s) or exposure(s)

Included

Nutrition education; Nutrition Care Education; Nutritional Support; Nutritional Assessment

Comparator(s) or control(s)

This review does not have any comparators

Study design

Only nonrandomized study types will be included.

Context

This review includes studies conducted in clinical, public health, educational, and institutional settings where dietitians or accredited nutrition professionals actively provide or manage nutrition care. Eligible studies must involve real-world implementation or evaluation of the Nutrition Care Process (NCP) or its terminology (NCPT) in professional practice.

Included settings span:

Hospitals (inpatient/outpatient units)

Community nutrition programmes

University-affiliated clinical training centers

Primary healthcare or outpatient clinics

National surveys of registered dietitians

Long-term care facilities and aged care services

Studies must take place in countries where dietetic practice is recognized (regulated or unregulated), with or without national dietetic associations. Studies in both low-resource and high-resource health systems are included to allow international comparison.

Exclusion Based on Setting:

Studies focused solely on student education, training simulations, or curriculum design (unless involving active professionals).

Settings unrelated to nutrition care delivery (e.g., administrative-only departments, IT units without direct clinical relevance).

Studies not involving practising nutrition professionals (e.g., patients, physicians, or nurses without a dietetic focus).

TIMELINE OF THE REVIEW

Date of first submission to PROSPERO 06 January 2026

Review timeline

Start date: 1 May 2025. End date: 2 April 2026.

Date of registration in PROSPERO

06 January 2026

AVAILABILITY OF FULL PROTOCOL

Availability of full protocol

A full protocol has been written but is not available because:

The full protocol was developed and approved internally as part of an academic review at theUniversity of Nicosia. It was not submitted for publication or deposited in a public repository, asthe review was originally conducted to fulfill academic requirements. Therefore, the protocol isnot publicly available.

SEARCHING AND SCREENING

Search for unpublished studies

Only published studies will be sought.

Main bibliographic databases that will be searched

The main databases to be searched are *CENTRAL - Cochrane Central Register of Controlled*

Trials, *CINAHL - Cumulative Index to Nursing and Allied Health Literature*, *CLIB - The Cochrane Library*, *Embase - Embase via Ovid*, *MEDLINE*, *PubMed*, *SCI - Science Citation Index* and *Scopus*.

Search language restrictions

The review will only include studies published in English.

Search date restrictions

There are no search date restrictions.

Other methods of identifying studies

Other studies will be identified by: *contacting authors or experts*, *looking through all the articles that cite the papers included in the review ("snowballing" or forward citation searching)* and *reference list checking (backward citation searching)*.

Link to search strategy

A full search strategy is available in the full protocol as described in the *Availability of full protocol* section

Selection process

Studies will be screened independently by at least two people (or person/machine combination) with a process to resolve differences.

Other relevant information about searching and screening

The search strategy was developed using the PICOS framework, in consultation with an experienced reviewer and following the PRISMA guidelines.

No publication status restrictions will be applied, but only peer-reviewed full-text articles will be included.

Searches will be limited to articles published between January 2009 and December 2024, in English or Greek.

Manual searching of reference lists from included studies and relevant reviews will be conducted to identify additional eligible publications.

Duplicate screening: Titles and abstracts will be screened independently by two reviewers, with disagreements resolved through discussion or consultation with a third reviewer.

Full texts of potentially eligible studies will be retrieved and evaluated against the inclusion/exclusion criteria by both reviewers independently.

The review team will use a shared tracking system (e.g., Excel or Covidence) to record screening decisions and justifications for exclusions at the full-text stage.

This structured approach aims to maximise transparency and reduce bias during study identification and selection.

DATA COLLECTION PROCESS

Data extraction from published articles and reports

Data will be extracted independently by at least two people (or person/machine combination) with a process to resolve differences.

Authors will not be contacted for further information.

Study risk of bias or quality assessment

Risk of bias will be assessed using: *Cochrane RoB-1* and *Cochrane RoB-2*

Data will be assessed independently by at least two people (or person/machine combination) with a process to resolve differences.

Additional information will **not** be sought from study investigators if required information is unclear or unavailable in the study publications/reports.

Reporting bias assessment

Risk of bias due to missing results will not be assessed

Certainty assessment

Certainty of findings will not be assessed

OUTCOMES TO BE ANALYSED

Main outcomes Main Outcomes:

Implementation Rate of the Nutrition Care Process (NCP) and/or NCPT

Proportion of dietitians or institutions actively using the NCP in practice

Frequency of use across different clinical settings and countries

Format of Implementation

Comparison of manual (handwritten or typed) vs. electronic (EHR-integrated, software-based)formats

Impact of format on usability and uptake

Documentation Quality

Clarity, completeness, and consistency of nutrition records using the NCP/NCPT

Standardisation of terminology in documentation

Workflow and Time Efficiency

Perceived or measured time required to complete NCP documentation

Influence of format (manual vs electronic) on workflow integration

Practitioner Confidence and Familiarity

Self-reported knowledge, training adequacy, and comfort in using NCP

Perceived value of NCP in professional practice

Barriers and Enablers to Implementation

Institutional, technological, educational, and organisational factors influencing adoption

Role of national dietetic associations, peer support, and EHR access

Additional outcomes

There are no additional outcomes.

PLANNED DATA SYNTHESIS

Strategy for data synthesis

No formal data synthesis is planned - data will be described but not combined.

CURRENT REVIEW STAGE

Stage of the review at this submission

Review stage Started Completed

Pilot work

Formal searching/study identification

Review stage Started Completed

Screening search results against inclusion criteria

Data extraction or receipt of IPD

Risk of bias/quality assessment

Data synthesis

Review status

The review is currently planned or ongoing.

Publication of review results

Results of the review will be published.

REVIEW AFFILIATION, FUNDING AND PEER REVIEW

Review team members

Professor Eleni Andreou (review guarantor and contact) ORCID: 0000-0002-0449-6782.

University of Nicosia. Cyprus.

No conflict of interest declared.

Elina Polydorou. ORCID: 0000-0002-2427-9347. University Of Nicosia. Cyprus.

No conflict of interest declared.

Named contact

Professor Eleni Andreou (andreou.el@unic.ac.cy). ORCID: 0000-0002-0449-6782. University of Nicosia. Cyprus.

Review affiliation

Department of Life Sciences, School of Life and Health Sciences, University of Nicosia

Funding source

Review has no funding and no agreed support from an academic institution and is done in authors' own time.

Peer review

There has been no peer review of this planned review.

ADDITIONAL INFORMATION

Review conflict of interest

Declared individual interests are recorded under team member details.. No additional interests are recorded for this review.

Medical Subject Headings

Cross-Sectional Studies; Delivery of Health Care; Dietetics; Documentation; Electronics;

Humans; Nutritionists; Patient Care; Public Health; Software; Technology

SIMILAR REVIEWS

Check for similar records already in PROSPERO

PROSPERO identified a number of existing PROSPERO records that were similar to this one (last check made on 6 January 2026). These are shown below along with the reasons given by that the review team for the reviews being different and/or proceeding.

- Evaluating the Performance of AI Medical Transcription Software: A Systematic Review [published 15 October 2024] [CRD42024597200]. The review was judged **not to be similar**

- Utilization of Digital Health Interventions for Nutrition Care of Cardiovascular Patients in the

Hospital: A Protocol for Mixed Methods Systematic Review [published 19 March 2025]

[CRD420251000373]. The review was judged **not to be similar**

- The Role of Electronic Health Records (EHR) in Improving Hospital Administrative Efficiency: A Systematic Review [published 24 July 2025] [CRD420251111148]. The review was judged **not to be similar**

PROSPERO version history

- Version 1.0, published 06 Jan 2026

Disclaimer

PROSPERO does not accept any liability for the content provided in this record or for its use.

Readers use the information provided in this record at their own risk.

Any enquiries about the record should be referred to the named review contact

Appendix IX: User manual

Οδηγός Χρήσης του e-ΔΔΔΦ

(Ηλεκτρονικό Εργαλείο PNDP σε Google Sheets) • Έκδοση: Φλεβάρης 2026

Σκοπός

Το e-ΔΔΔΦ είναι ένα ηλεκτρονικό πρότυπο τεκμηρίωσης που μεταφράζει τη λογική του PNDP σε δομημένη ροή εργασίας μέσα σε περιβάλλον Google Sheets. Στόχος του είναι να υποστηρίζει συστηματική καταγραφή εκτίμησης, διάγνωσης, παρέμβασης και παρακολούθησης/αξιολόγησης, με μειωμένη εξάρτηση από ελεύθερο κείμενο και με δυνατότητα παραγωγής συνοπτικής αναφοράς.

Πρόσβαση και αρχική ρύθμιση

Ανοίξτε το αρχείο e-ΔΔΔΦ στο Google Sheets.

Αν σας ζητηθεί, επιλέξτε «Αρχείο > Δημιουργία αντιγράφου» ώστε να εργάζεστε σε δικό σας αντίγραφο.

Αν εμφανιστεί προειδοποίηση για σενάρια (Apps Script), επιτρέψτε τα απαραίτητα δικαιώματα για να λειτουργήσουν τα προσαρμοσμένα μενού/εντολές.

Δομή αρχείου και φύλλα εργασίας

Το αρχείο περιλαμβάνει τα ακόλουθα φύλλα (καρτέλες), με ακριβή ονόματα:

Εξώφυλλο

«Ανθρωπομετρική και Βιοχημική Αξιολόγηση»

«Αξιολόγηση Ιατρικού Ιστορικού»

«Καταγραφή Φ.Α.»

«Διατροφική και Διαιτολογική Διάγνωση»

«Περίληψη ΔΔΔΦ)»

Φύλλο	Ρόλος/περιεχόμενο
Ανθρωπομετρική και Βιοχημική Αξιολόγηση	Χαρακτηριστικά Δικαιούχου, Σωματομετρικά δεδομένα και σχετικές μετρήσεις εκτίμησης.
Αξιολόγηση – Ιατρικό Ιστορικό	Ιατρικό ιστορικό, σχετικές διαγνώσεις/κωδικοποίηση και κλινικές πληροφορίες.
Καταγραφή Φαρμακευτικής Αγωγής (Φ.Α.)	Φαρμακευτική αγωγή και στοιχεία που συνδέονται με διατροφικές αλληλεπιδράσεις.
Διατροφική και Διαιτολογική Διάγνωση (ΔΔΝ)	Δομημένη διατύπωση διατροφικής/διαιτολογικής διάγνωσης (π.χ. λογική PAS).
Περίληψη Αξιολόγησης ΔΔΔΦ	Συγκεντρωτική προβολή/αναφορά με αντιγραφή-σύνθεση των επιμέρους πινάκων.

Προτεινόμενη ροή χρήσης

Η ακόλουθη ροή προτείνεται για την ολοκλήρωση μιας τεκμηριωμένης επίσκεψης/εκτίμησης:

Συμπληρώστε τα βασικά σωματομετρικά στοιχεία στο «Ανθρωπομετρική και Βιοχημική Αξιολόγηση»

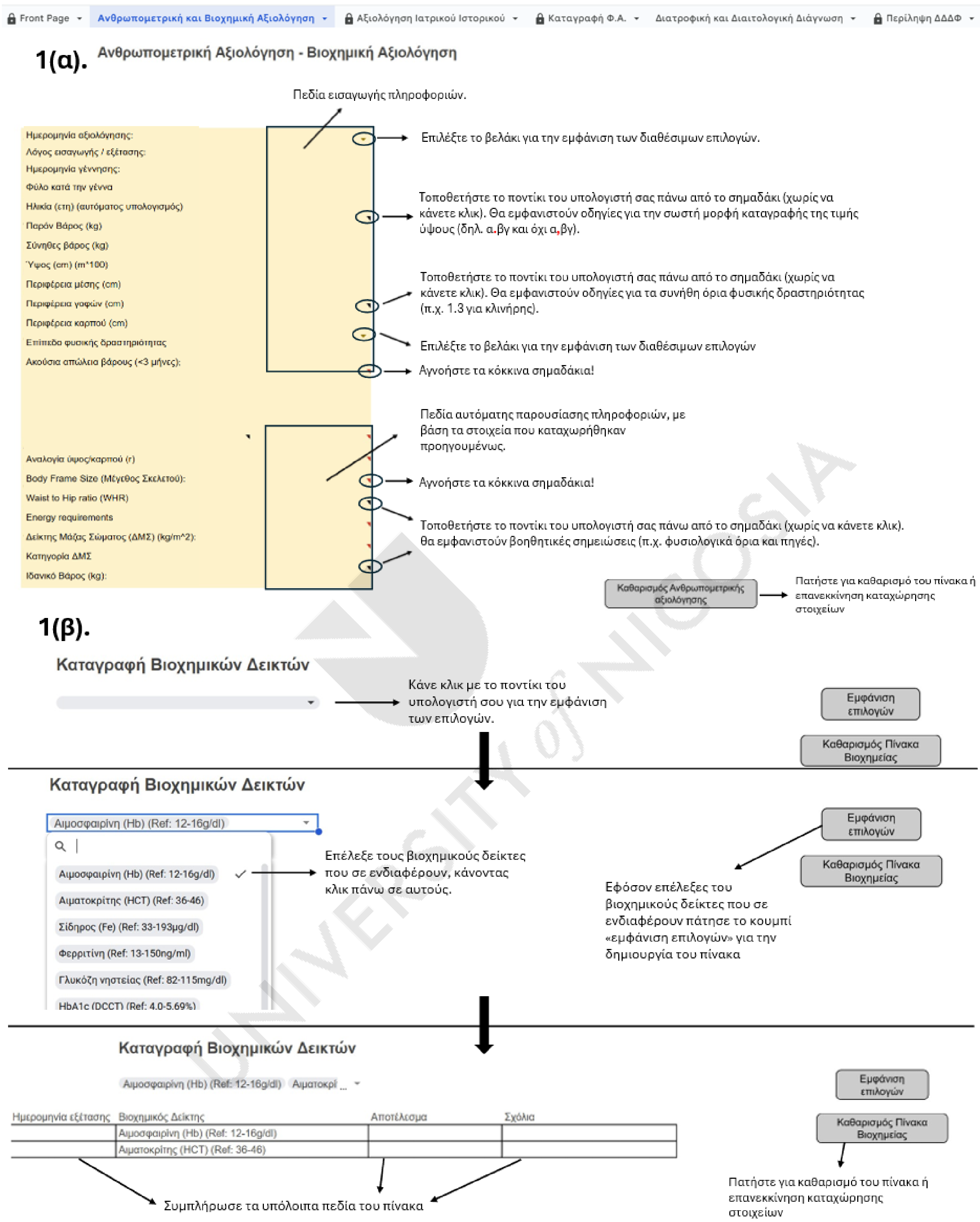
Ολοκληρώστε το κλινικό πλαίσιο στο «Αξιολόγηση Ιατρικού Ιστορικού».

Σημειώστε τα φάρμακα στο «Καταγραφή Φαρμακευτικής Αγωγής (Φ.Α.)» (και σχετικές παρατηρήσεις/αλληλεπιδράσεις όπου υπάρχουν).

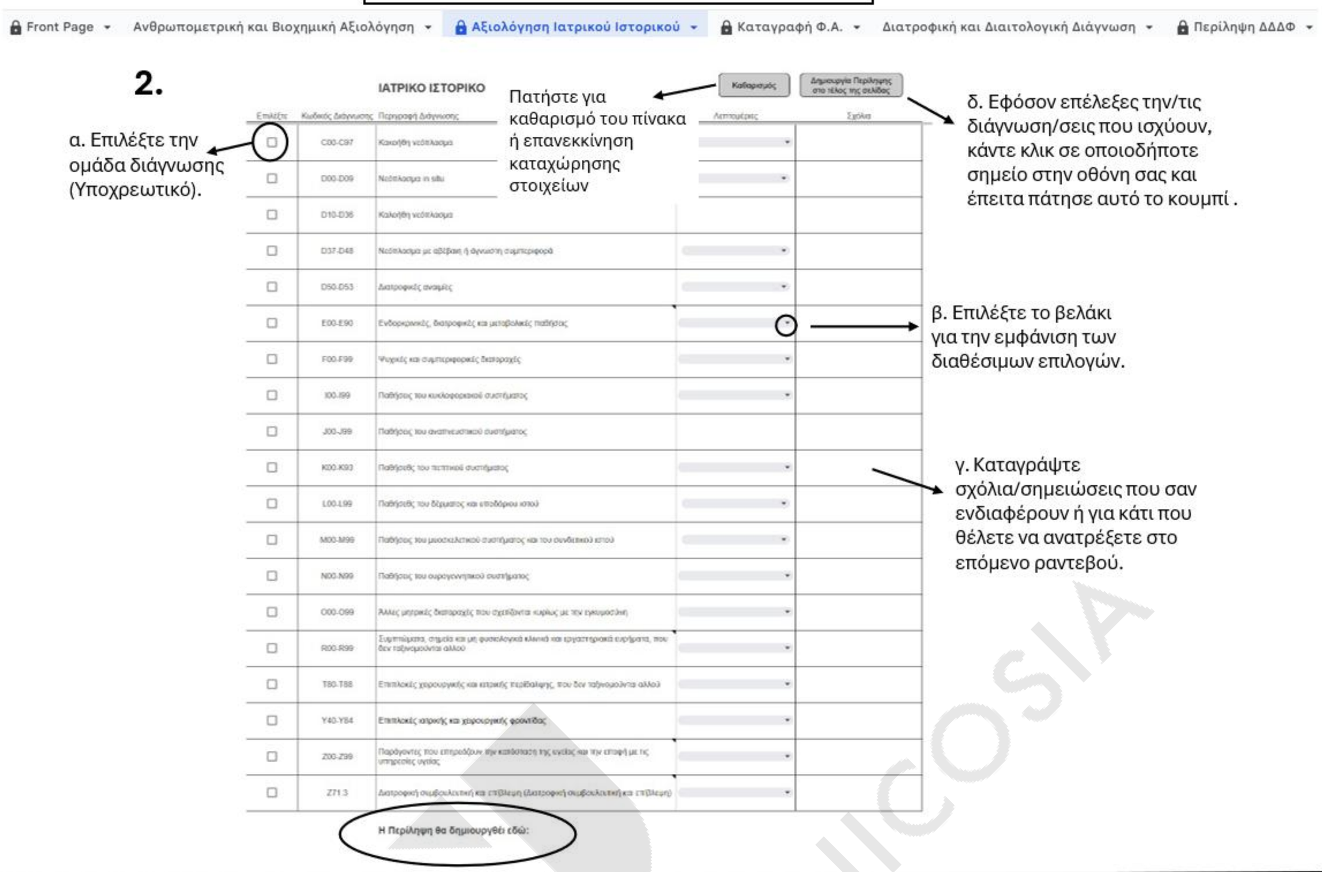
Διατυπώστε τη διατροφική/διαιτολογική διάγνωση στο «Διατροφική και Διαιτολογική Διάγνωση (ΔΔΝ)».

Μεταβείτε στο «Περίληψη ΔΔΔΦ» για να συγκεντρώσετε τους πίνακες και να παράγετε αναφορά.

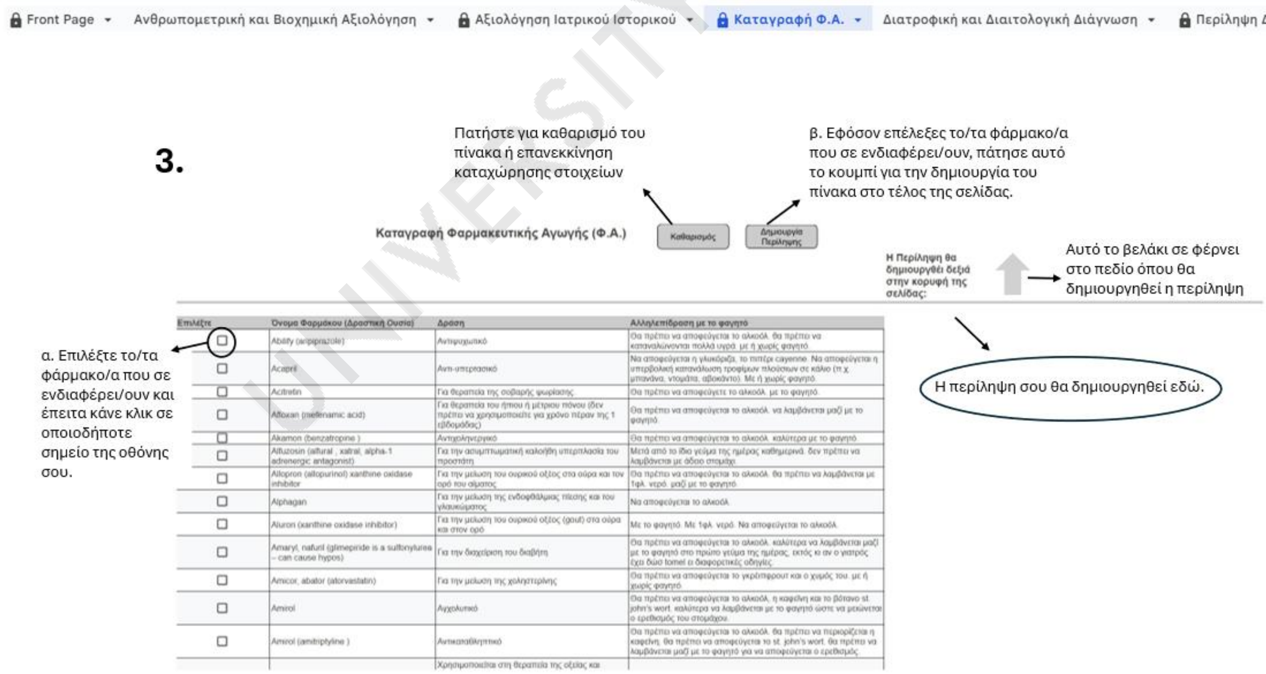
Στάδιο Ανθρωπομετρικής Αξιολόγησης και Αξιολόγηση Βιοχημικών Δεικτών



Στάδιο συλλογής Ιατρικού Ιστορικού

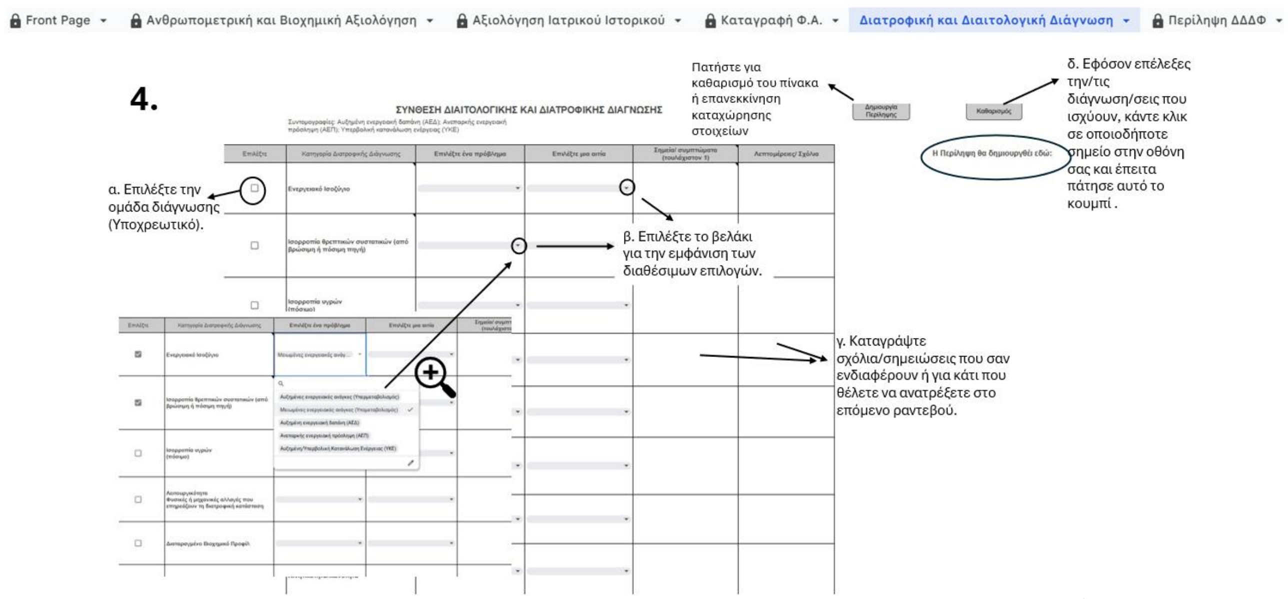


Στάδιο συλλογής Φαρμακευτικής Αγωγής

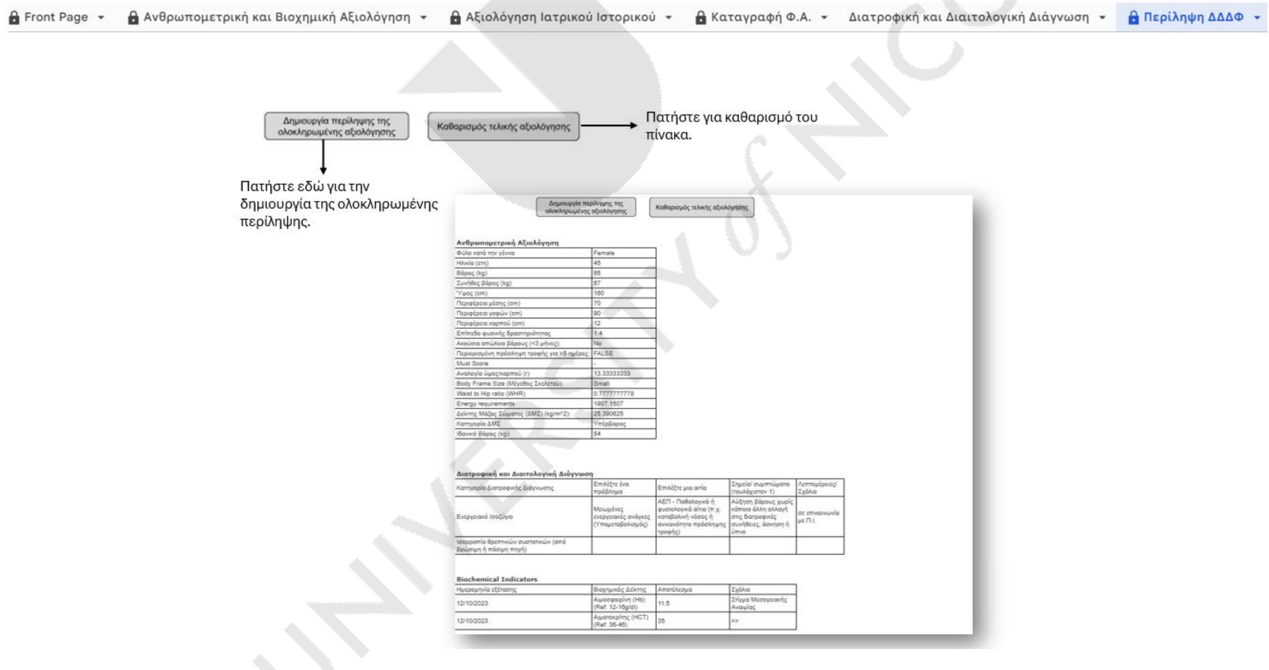


Σύνθεση Διαιτολογικής και Διατροφικής Διάγνωσης

4.



5. Δημιουργία Τελικής Περίληψης των στοιχείων που έχουν καταχωρηθεί



Σύνοψη και αναφορά στο «Summary of Assessment»

Το φύλλο «Περίληψη ΔΔΔΦ» χρησιμοποιείται για να συγκεντρώνει τους πίνακες/ενότητες σε μορφή αναφοράς. Ανάλογα με τη ρύθμιση του αρχείου, η αντιγραφή και μορφοποίηση μπορεί να γίνεται μέσω προσαρμοσμένων επιλογών μενού ή μέσω κουμπιών/εντολών που εκτελούν αυτοματισμούς (π.χ. αντιγραφή πινάκων, καθαρισμός ενοτήτων, κλείσιμο μεγάλων κενών). Μετά την αντιγραφή των πινάκων, αποθηκεύστε ή εξάγετε την αναφορά (π.χ. Αρχείο > Λήψη > PDF) όταν ολοκληρωθεί η τεκμηρίωση.

Καθαρισμός και επαναχρησιμοποίηση

Για επαναχρησιμοποίηση του προτύπου σε νέο περιστατικό, συνιστάται η δημιουργία καινούργιου αντιγράφου (π.χ. Αρχείο > Δημιουργία αντιγράφου) ή εκκαθάριση των πεδίων εισαγωγής και της σύνοψης. Αν το αρχείο περιλαμβάνει εντολές εκκαθάρισης ανά ενότητα ή συνολικά, χρησιμοποιήστε τις ώστε να αποφεύγεται υπολειμματική πληροφορία από προηγούμενο περιστατικό.

Συχνά προβλήματα

Δεν λειτουργούν τα προσαρμοσμένα μενού/εντολές: ελέγξτε ότι έχετε αποδεχθεί τα απαιτούμενα δικαιώματα (Apps Script) και ανανεώστε τη σελίδα.

Δεν ενημερώνεται η σύνοψη: βεβαιωθείτε ότι οι ενότητες έχουν συμπληρωθεί και ότι εκτελείται η εντολή αντιγραφής/συγκέντρωσης.

Αλλαγές μορφοποίησης: αποφύγετε την απευθείας επεξεργασία δομικών κελιών/τύπων, εκτός αν γνωρίζετε τη λειτουργία τους.

Appendix X: Revised Systematic Review

Summary of Revised the Systematic Review

This systematic review evaluates the global implementation of the Nutrition Care Process (NCP) and Nutrition Care Process Terminology (NCPT) across dietetic settings, with a particular focus on differences between manual (paper-based) and electronic (software-based) formats. The review included 11 reports representing 8 studies (2009–2024), following PRISMA guidelines, and analysed evidence from diverse international healthcare contexts.

Overall, the findings indicate that NCP implementation remains inconsistent worldwide, largely due to systemic and organizational factors rather than individual practitioner resistance. The most commonly identified barriers were lack of training, time constraints, and limited technological infrastructure, while key facilitators included support from national dietetic associations (NDAs), peer collaboration, and access to electronic health records (EHRs).

A major theme across the included studies is the advantage of electronic NCP formats over manual approaches. Electronic systems were consistently associated with improved documentation quality, better workflow efficiency, and increased practitioner confidence, largely due to structured templates and integration within EHR systems. In contrast, manual documentation was often described as time-consuming, less standardized, and more difficult to implement consistently, contributing to lower adoption rates.

Despite these advantages, the review emphasizes that technology alone is insufficient. Successful implementation depends on a combination of structured training, institutional support, workflow integration, and professional engagement. Even in settings with digital tools, persistent barriers such as time pressure and insufficient education continue to limit uptake.

The review also highlights significant international variability, with higher adoption and digital integration reported in countries such as the United States and Australia, compared to lower uptake in regions with limited infrastructure or delayed implementation strategies.

Importantly, while there is strong evidence that NCP improves care processes (e.g., documentation and professional practice), there is limited and indirect evidence regarding its impact on patient outcomes, due to the predominance of observational and qualitative studies.

In conclusion, the review suggests that integrating NCP into electronic systems, supported by policy, training, and professional networks, is key to improving adoption and consistency in dietetic practice. However, further high-quality interventional research is needed to determine its long-term effects on patient health outcomes.

Systematic Review

Adoption of the Nutrition Care Process in Manual and Software Formats: A Systematic Review Across International Dietetic Settings

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Academic Editor(s): Name

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Accepted: 28 April 2026

Published: date

Highlights

What are the main findings?

Barriers to NCP implementation include limited training, time constraints, and insufficient technological infrastructure, while key facilitators are professional support, peer collaboration, and access to electronic health records.

Electronic NCP formats are generally associated with improved documentation quality, workflow efficiency, and practitioner confidence compared to manual approaches.

What are the implications of the main findings?

Successful NCP implementation requires not only digital integration but also structured training, institutional support, and alignment with clinical workflows.

Future research should prioritize high-quality interventional studies and standardized outcome measures to evaluate the impact of NCP adoption on clinical practice and patient-related outcomes.

Abstract

Background/Objectives: The Nutrition Care Process (NCP) is a standardized model designed to improve the quality and consistency of nutrition care. However, its implementation remains variable across settings, influenced by factors such as time constraints, training, peer support, and technological infrastructure. This systematic review aims to synthesize the available evidence on barriers and facilitators influencing the implementation of the NCP/NCPT and to explore how different documentation formats may influence its adoption. Methods: This systematic review was conducted in accordance with PRISMA 2020 guidelines and included peer-reviewed studies published between 2009 and 2024 in English or Greek. Searches were conducted in MEDLINE, EMBASE, Scopus, CINAHL, and the Cochrane Library. Study quality was assessed using the National Heart, Lung, and Blood Institute (NIH) tool. A total of 11 reports representing eight studies were included, comprising cross-sectional, cohort, qualitative, and pilot designs. Results: The most commonly reported barriers to NCP implementation were lack of training, time constraints, and limited technological infrastructure. Key facilitators included support from national dietetic associations, peer collaboration, and access to electronic health records (EHRs). Electronic formats were more frequently described as supporting improved documentation practices, practitioner confidence, and workflow efficiency, whereas manual approaches were commonly reported as time-consuming and less structured. Conclusions: Digital integration of the NCP may support more consistent documentation practices and improved workflow processes; however, the current evidence is largely observational and heterogeneous. Evidence regarding patient-level outcomes remains limited, and definitive conclusions regarding the comparative effectiveness of implementation formats cannot be drawn. Further high-quality research is needed to evaluate the long-term clinical impact of NCP implementation.

Keywords: clinical nutrition; medical nutrition therapy; nutrition care process; implementation; electronic health records

1. Introduction

Variation in clinical treatment plans persists, not only between individual healthcare professionals (HCPs), but also within an individual HCP's practice [1]. This inconsistency highlights the need for standardization in clinical care. Standardization refers to the adoption of protocols, frameworks, guidelines, and relevant terminology to ensure consistency and quality in clinical practice.

The development of clinical care processes (CCPs) dates back to the early years of medicine. However, continuous updates and the accumulation of fragmented information over time have contributed to confusion and resistance to the implementation of such processes.

In response to this need, the Academy of Nutrition and Dietetics introduced the Nutrition Care Process (NCP) in 2002 as part of an action plan to standardize nutrition care. In 2012, the NCP was incorporated as a fundamental component of the Standards of Practice (SOP) for dietitians, alongside the International Dietetics and Nutrition Terminology (IDNT), now known as the Nutrition Care Process Terminology (NCPT). Subsequently, in 2016, the NCP was included in the competency standards for qualified nutritionists and dietitians by the International Confederation of Dietetic Associations (ICDA), developed in collaboration with the European Federation of Dietetic Associations (EFAD) [2,3].

The Nutrition Care Process (NCP) was introduced by these organizations as a standardized framework to support dietitians in delivering consistent, patient-centered care. It facilitates concise and structured documentation, enhances critical thinking, and improves adherence to clinical guidelines, ultimately contributing to reduced practice variation and associated healthcare costs. Furthermore, the use of the NCP in collaborative care settings has been shown to enhance the perceived value of nutrition and dietetic professionals among other healthcare professionals (HCPs) [4].

More recently, the format through which the NCP is implemented—manual (paper-based or typed) versus electronic or software-based documentation—has emerged as a key determinant of its adoption. Differences in usability, time efficiency, integration with electronic health records (EHRs), and availability of institutional support may substantially influence implementation success across healthcare settings [4]. More recently, the format through which the NCP is implemented—manual (paper-based or typed) versus electronic or software-based documentation—has emerged as a critical determinant of adoption. In this context, manual formats refer to paper-based or non-integrated documentation methods, whereas electronic formats involve software-based or electronic health record (EHR)-integrated systems that support structured documentation. Differences in usability, time efficiency, integration with electronic health records, and institutional support may substantially influence implementation success across settings.

Despite these documented benefits, the implementation of the NCP remains inconsistent worldwide. Therefore, this systematic review aims to synthesize the available evidence on barriers and facilitators influencing the implementation of the Nutrition Care Process. In addition, it explores how different documentation formats (manual versus electronic/software-based) may influence NCP/NCPT adoption across settings. Specifically, the review seeks to identify patterns of NCP/NCPT implementation and examine the key factors influencing its uptake in clinical practice. This review is therefore positioned as an implementation-focused systematic review, aiming to understand how the Nutrition Care Process is adopted and applied in real-world clinical settings rather than to evaluate the effectiveness of specific interventions.

2. Materials and Methods

2.1. Study Selection

This systematic review was conducted in accordance with the PRISMA 2020 guidelines and was prospectively registered in the International Prospective Register of Systematic Reviews(PROSPERO; Registration No: CRD420261279775). The completed PRISMA checklist is available in Supplementary File S1 [5]. The eligibility criteria were defined using the PICOS framework (Table 1).

Table 1. PICOS framework used in this systematic review.

Component	Description
P (Population)	Registered Dietitians, nutritionists, and healthcare professionals involved in the implementation of the Nutrition Care Process
(I)Exposure/Context	Implementation of the Nutrition Care Process (NCP/NCPT) in clinical practice
C (Comparison)	Not restricted; where available, differences between manual (paper-based or typed) and electronic/software-based formats were considered
O (Outcomes)	Barriers and facilitators to implementation, adoption patterns, usability, documentation quality, workflow integration, and related outcomes
S (Study Design)	Observational studies, qualitative studies, mixed-methods studies, and implementation reports

Studies were included if they met the following criteria: published between 2009 and 2024; available in full text; written in English or Greek; original, peer-reviewed research; focused on the implementation of the Nutrition Care Process (NCP) or Nutrition Care Process Terminology

(NCPT); involved registered dietitians or accredited nutrition professionals; and employed cross-sectional, cohort, pilot, or qualitative designs.

Studies were excluded if they were review articles, conference abstracts, letters, or commentaries; non-peer-reviewed publications; animal studies; focused on unofficial or developmental tools similar to the NCP; duplicates; or not directly relevant to NCP/NCPT implementation.

A systematic literature search was conducted in MEDLINE, EMBASE, Scopus, CINAHL, and the Cochrane Library, covering publications from 2009 to 2024. The final literature search was conducted in December 2024. The search strategy combined Medical Subject Headings (MeSH) and free-text terms, where applicable, related to the Nutrition Care Process and its implementation. Search terms included "Nutrition Care Process", "NCP", "NCPT", "implementation", "adoption", "electronic health records", and "documentation". Boolean operators (AND, OR) were used to combine terms.

An example search strategy for MEDLINE was: ("Nutrition Care Process" OR "NCP" OR "NCPT") AND (implementation OR adoption OR utilization) AND (electronic OR digital OR manual OR paper OR "electronic health records" OR EHR). The full search strategies for all databases are provided in Supplementary Material, Supplementary Table S2

Two researchers independently screened titles and abstracts, followed by full-text assessment for eligibility. Discrepancies were resolved through discussion and consensus. The reference lists of included studies were also screened to identify additional relevant articles.

2.2. Data Extraction

Data extraction was performed independently by two researchers (E.P., E.A.) using a standardized Excel form. The following information was extracted from each included study: author(s), year of publication, country, study design, sample size, participant characteristics, implementation format of the Nutrition Care Process (manual, electronic, or mixed), and clinical or organizational setting.

In addition, key outcomes related to NCP implementation were extracted, including reported barriers and facilitators, adoption patterns, documentation practices, workflow integration, practitioner perceptions, and any reported statistical findings. Where available, information on implementation context (e.g., institutional, national, or multinational) and use of electronic health records was also recorded.

Disagreements between researchers were resolved through discussion and consensus.

Where multiple reports were derived from the same underlying study, these were identified and grouped accordingly. A mapping of reports to their corresponding studies is provided in Supplementary Table S2. To avoid double-counting, data extraction and synthesis were conducted at the study level rather than the report level.

2.3. Review Framework (PICOS)

The review question was structured using a modified PICOS framework (Table 1). Given the implementation-focused nature of the included evidence, the "intervention" component was interpreted as exposure/context, referring to the implementation of the Nutrition Care Process (NCP/NCPT) in clinical practice rather than a controlled intervention.

2.4. Quality Assessment

Study quality and risk of bias were assessed independently by two researchers (E.P., E.A.) using the National Heart, Lung, and Blood Institute (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies, a validated instrument widely used for evaluating observational study designs [6]. Each study was rated as high, medium, or low quality. Disagreements were resolved through discussion and consensus. No automation tools were used in the appraisal process.

Given the heterogeneity of the included studies and the predominance of non-comparative designs, this review was conducted as an implementation-focused synthesis rather than a conventional intervention–comparison systematic review.

Methodological quality was assessed using design-appropriate tools. The NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies was applied to quantitative observational studies, while qualitative studies were appraised using the Critical Appraisal Skills Programme (CASP) checklist. Critical Appraisal Skills Programme (CASP). CASP Qualitative Checklist. Available online: https://casp-uk.net/casp-tools-checklists/ (accessed on 1 December 2024). The CASP checklist was used to assess key domains including study validity, methodological rigor, clarity of data collection and analysis, and relevance of findings.

Quality assessment results were analyzed separately by study design, and no numerical aggregation was performed across heterogeneous methodologies. For observational studies, overall quality ratings were categorized as high, moderate, or low based on predefined thresholds. Quality assessment findings were interpreted within the context of study design. For quantitative observational studies, quality scores were calculated as the proportion of criteria met out of the total applicable items. Based on these scores, studies were categorized as high (≥75%), moderate (50–74%), or low (<50%) quality.

2.5. Data Synthesis

Given the methodological heterogeneity across the included studies, including variations in study design, clinical settings, and outcome measures, a narrative synthesis approach was employed. Study findings were summarized thematically without statistical pooling or meta-analysis. Outcomes were grouped according to implementation format (manual, electronic, or mixed) and contextual factors, including multinational, national, institutional, and prototype-based settings.

Sources of heterogeneity were explored descriptively using frequencies and proportions across these groupings. Reported p-values were extracted and interpreted within the context of individual studies, without transformation, imputation, or cross-study comparison.

To support interpretation, a qualitative grading of evidence was applied. Evidence was categorized as strong, moderate, or weak based on the consistency of findings, the number of supporting studies, and their methodological quality. A formal assessment of certainty (e.g., GRADE) was not feasible due to the heterogeneity of study designs and outcomes; therefore, a structured narrative approach was adopted.

For the synthesis of barriers, facilitators, and implementation patterns presented in Figures 1 and 2, data were aggregated at the study level to avoid duplication of evidence. Each factor was counted once per study, regardless of the number of associated reports. Frequencies therefore reflect the number of studies reporting a given factor rather than the number of individual reports or participants.

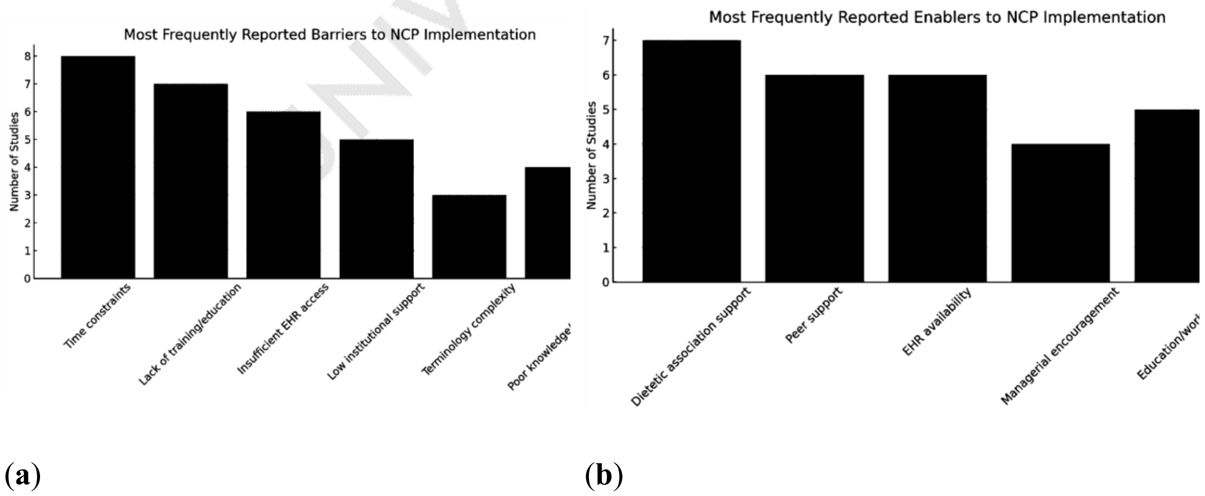

Figure 1. Factors influencing the Nutrition Care Process (NCP) and Nutrition Care Process Terminology (NCPT): (**a**) Most Frequently Reported Barriers to NCP Implementation; (**b**) Most Frequently Reported Enablers to NCP Implementation.

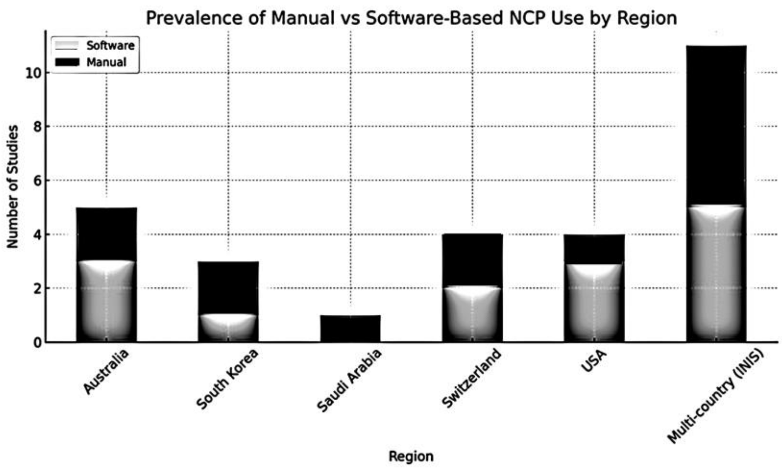

Figure 2. Prevalence of Manual vs. Software-Based NCP use by Region.

2.6. Protocol Registration and Amendments

After PROSPERO registration, several methodological refinements were made. First, the planned risk-of-bias assessment was revised; although Cochrane RoB tools were initially listed in the registration, the final review used the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies [6], as this was considered more appropriate for the predominantly observational evidence base; qualitative studies were appraised descriptively. Second, the search strategy was refined by applying a publication-year limit of 2009–2024 and by restricting the final searches to MEDLINE, EMBASE, Scopus, CINAHL, and the Cochrane Library, with reference list screening of included studies. Third, although the registration did not specify formal comparators, the final synthesis was organized around comparison of manual and electronic/software-based NCP implementation formats. Finally, while no quantitative meta-analysis was undertaken, the final review adopted a structured narrative synthesis with grouping by implementation format and study context, together with a qualitative judgment of evidence strength. These amendments were made to better align the review methods with the nature and heterogeneity of the included studies.

2.7. Reporting Bias Assessment

The potential for reporting bias (including publication bias) was considered during the review process. However, due to the limited number of included studies and the methodological heterogeneity (including qualitative, cross-sectional, and mixed-methods designs), a formal quantitative assessment of reporting bias (e.g., funnel plots or statistical tests) was not feasible.

Instead, efforts were made to minimize reporting bias through a comprehensive search strategy across multiple databases, inclusion of reference list screening, and the application of predefined eligibility criteria. The potential impact of reporting bias is acknowledged as a limitation of this review.

3. Results

A total of 11 reports representing eight unique studies were included in this review. Where multiple reports originated from the same study, findings were synthesized at the study level to ensure that evidence was not double-counted (see Supplementary Table S2). Although studies published in Greek were included in the search strategy, no eligible studies in the Greek language met the inclusion criteria.

The most frequently reported barriers were lack of training, time constraints, and limited technological infrastructure, while key facilitators included support from national dietetic associations, peer collaboration, and access to electronic health records. Electronic formats were generally associated with improved documentation quality, enhanced workflow efficiency, and greater practitioner confidence compared to manual approaches. Despite variability in study design and setting, these findings highlight consistent themes influencing NCP adoption across diverse healthcare contexts.

The PRISMA flow chart (Figure 3) summarizes the study selection process. A total of 11 reports representing eight studies were included in the final analysis. Six full-text articles were excluded after eligibility assessment. Reasons for exclusion included review article design and lack of direct relevance to NCP/NCPT implementation. These studies reflect a range of international settings and healthcare systems. Study designs included cross-sectional surveys, cohort studies, qualitative focus groups, and pilot interventions. Sample sizes ranged from 12 to 6498 participants.

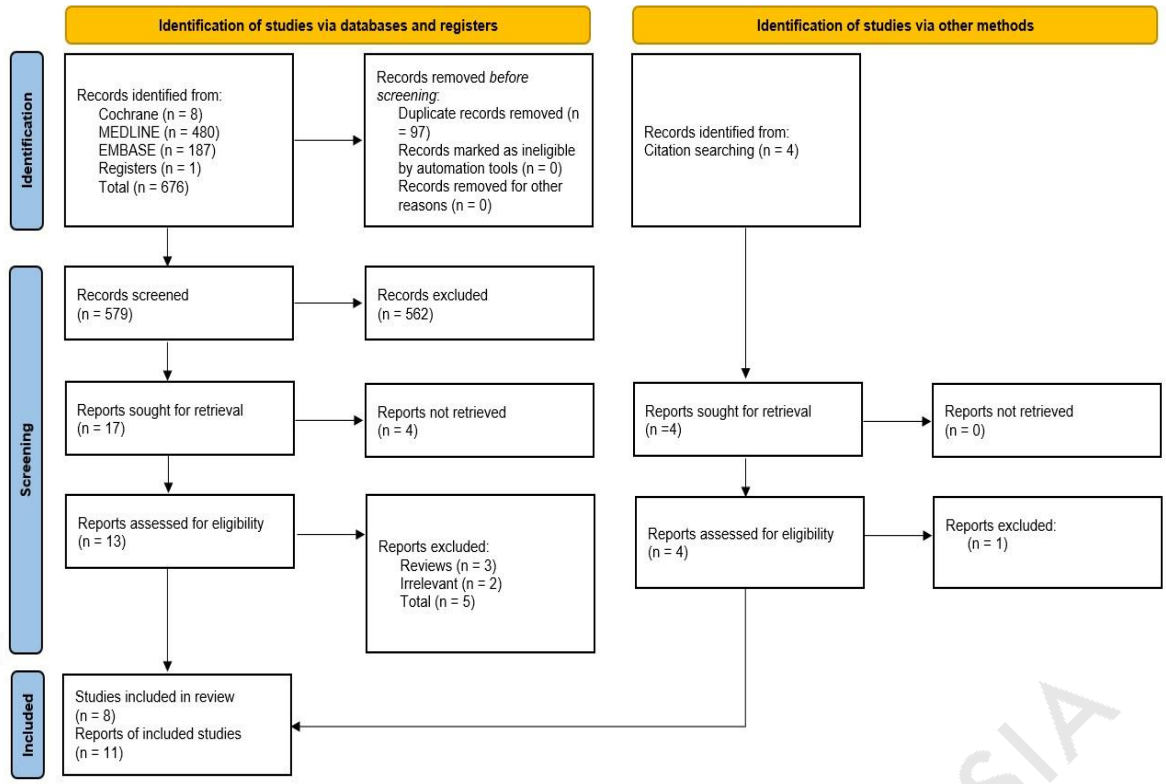

Figure 3. PRISMA Flow Diagram.

3.1. Study Characteristics

The included studies covered diverse regions and practice environments. Data were extracted on country, study design, sample size, implementation format (manual vs. electronic), and key findings. These are summarized in Table 2.

Table 2. Summary of study characteristics of the included reports. Study IDs indicate grouping of reports derived from the same underlying study (Supplementary Table S2).

Authors	Study ID	Country	Study Design	Sample Size	NCP-Format	Key Findings	Quality *
Alkhaldy et al. [7]	Study A	Saudi Arabia	Cross-sectional (quantitative)	56 dietitians	Manual (Excel use; some informal digital methods)	Majority were aware of NCP but lacked formal training; barriers included lack of experience, inadequate staffing, and protocol conflicts.	Medium
Kim and Baek [8]	Study B	Republic of Korea	Questionnaire survey	35 hospitals	Mixed (Manual and Computerized form)	Limited full NCP implementation; 21 hospitals plan future adoption	Medium
Lövestam et al. [9]	Study C	10 countries	International cohort (survey)	6498 dietitians	Mostly manual; NCPT less used	NCP used more than NCPT ($p < 0.001$); stronger implementation in	High

						inpatient settings; Greece lowest awareness (50%)	
Lövestam et al. [10]	Study C	10 countries	Cross-sectional (validated online survey)	5727 professionals	Mixed	Top barrier: time (39%); top enabler: national dietetic association support (69%); country-specific differences significant	High
O'Sullivan, Lo and Vivanti [11]	Study D	Australia, New Zealand, Singapore	Online survey	377 dietitians	Mixed	65% currently use NCP; main barriers: lack of time, training, knowledge, and EHR access; benefit to patient care statistically supported	High
Vivanti, Lewis and O'Sullivan [12]	Study D	Australia	Cohort design (2011 and 2014)	218 in 2011, 205 in 2014	Online survey using ASK NCP	Knowledge barrier reduced ($p < 0.001$); improved perceptions of NCP structure, documentation clarity, and care quality	High
Lövestam, Bostrom and Orrevall [13]	Study E	Sweden	Qualitative (focus groups)	37 dietitians	Manual, semi-guided	Independent dietitians struggled without formal support; time pressure and terminology complexity were major issues	Medium
Porter, Devine and O'Sullivan [14]	Study F	Australia	Mixed-methods (with control group)	35 dietitians	Manual vs. software and training	Training package increased knowledge, support, and familiarity; barriers: unclear implementation strategy, PES difficulty	High
O'Sullivan [15]	Study G	Australia	Pilot study (survey, case study, pre-/posttest)	12 dietitians	Electronic prototype	86% had not used NCP/NCPT due to knowledge gaps; prototype improved speed, accessibility, and documentation clarity	Medium
Vinci et al. [16]	Study H	Switzerland	Qualitative (secondary analysis)	228 dietitians	Mixed	99% awareness; key enablers: peer support, EHR, association recommendations; language-based differences observed	High
Porter et al. [17]	Study F	Australia	Mixed-methods (with control)	70 dietitians	Online survey using ASK NCP	Post implementers of NCP report higher knowledge, familiarity, confidence,	High

with main barriers being workload, time constraints. Pre- implementers reported lack of knowledge, training and support as barriers.

Note: YES = criterion satisfied; NO = criterion not satisfied; NR = not reported; NA = not applicable. Quality scores (%) were calculated as the proportion of satisfied criteria out of the total applicable items. *Quality ratings were defined as high (≥75%), moderate (50–74%), and low (<50%).

Observed differences between countries appeared to reflect variations in implementation timelines, professional support structures, and access to technological infrastructure.

3.2. Outcomes and Key Findings Across Studies

The outcomes assessed across the included studies varied but primarily focused on implementation patterns, barriers and facilitators, documentation quality, and practitioner-related outcomes. A structured summary of outcomes and key findings across studies is presented in Table 3.

Table 3. Summary of outcomes and key findings across included studies.

Study	Study Design	NCP Format	Outcomes Assessed	Key Findings
Alkhaldy et al. [7]	Cross-sectional	Manual	Awareness, barriers, training	Majority aware but lacked training; barriers included lack of experience, staffing, and workflow conflicts
Kim and Baek [8]	Survey	Mixed	Knowledge, implementation, barriers	Limited implementation; knowledge gaps and training needs identified
Lövestam et al. [9]	Internation-al sur-vey/cohort	Mostly manual	Implementation rates, barriers, facilitators	NCP more used than NCPT; stronger implementation in inpatient settings; NDA support and EHR access key facilitators
Lövestam et al. [10]	Cross-sectional survey	Mixed	Barriers, facilitators	Time constraints most common barrier; NDA support strongest facilitator
O'Sullivan, Lo and Vivanti [11]	Survey	Mixed	Adoption, barriers	Moderate adoption; barriers included lack of time, training, and EHR access

Vivanti, Lewis and O'Sullivan [12]	Cohort survey	Mixed	Knowledge, perceptions, implementation	Improved knowledge and confidence over time, but time barrier persisted
Lövestam, Bostrom and Orrevall [13]	Qualitative (focus groups)	Manual	Implementation experiences	Time pressure, lack of support, and terminology complexity hindered implementation
Porter, Devine and O'Sulli-van [14]	Mixed-methods	Manual vs. electronic (training)	Knowledge, confidence, implementation	Training improved knowledge and confidence; implementation strategy influenced outcomes
O'Sullivan [15]	Pilot study	Electronic	Usability, documentation, adoption	Electronic prototype improved speed, accessibility, and documentation clarity
Vinci et al. [16]	Secondary analysis	Electronic/Mixed	Implementation, facilitators	High awareness; peer support and EHR key facilitators
Porter et al. [17]	Intervention development	Mixed	Implementation support	Structured implementation improved familiarity but not time efficiency

NCP = Nutrition Care Process; NCPT = Nutrition Care Process Terminology; EHR = Electronic Health Records.

3.3. Comparison of Manual and Electronic NCP Implementation

Although no statistical synthesis was conducted, a narrative comparative analysis of manual and electronic NCP implementation formats (Table 4) suggests that electronic formats were more frequently associated with favorable outcomes. These included improved documentation practices, enhanced workflow efficiency, and greater practitioner confidence.

In contrast, manual approaches were commonly described as more time-consuming and less structured, which may contribute to lower levels of adoption. However, these observations are primarily based on non-comparative and self-reported data and should therefore be interpreted with caution.

Both formats were influenced by similar barriers, including limited training and time constraints, while facilitators such as peer support and institutional endorsement were consistently identified as important for implementation.

Overall, the findings indicate that digital integration may support improved usability and consistency; however, successful adoption of the NCP appears to depend on a combination of technological infrastructure, organizational support, and contextual factors.

Table 4. Comparison of manual versus electronic NCP implementation across included studies.

Outcome	Manual Format	Electronic Format	Evidence Summary
Implementation rate	Lower adoption; inconsistent use	Higher adoption when integrated into EHRs	Higher adoption of electronic formats may be supported by integration within existing clinical systems, reducing duplication of work and facilitating routine use
Time efficiency	Often perceived as time-consuming	Improved efficiency, though initial adaptation required	Electronic formats may enhance efficiency through structured templates and automated documentation processes, although initial training and adaptation are required
Documentation quality	Variable, less structured	More standardized, complete, and legible	Digital systems support standardized documentation through predefined fields, embedded terminology (NCPT), and improved legibility
Practitioner confidence	Lower confidence due to complexity and lack of support	Increased confidence with structured digital tools	Structured interfaces, decision-support features, and guided workflows may enhance practitioner confidence and reduce uncertainty
Training requirements	High reliance on individual knowledge and experience	Facilitated through structured systems and digital tools	Electronic systems may reduce reliance on individual expertise by embedding guidance and standardized processes, although training remains necessary
Workflow integration	Often perceived as disruptive	Better integration within clinical workflows when embedded in EHRs	Integration within EHR systems may support smoother workflow alignment and reduce fragmentation of documentation processes
Barriers	Time constraints, lack of training, terminology complexity	Initial technical challenges, access to systems	Both formats are affected by common barriers; however, electronic formats introduce additional technical and system-related challenges

Facilitators	Peer support, institutional encouragement	EHR access, structured templates, NDA support	Electronic systems may enhance existing facilitators by providing structural support, although organizational and professional factors remain critical

NCP = Nutrition Care Process; NCPT = Nutrition Care Process Terminology; EHR = Electronic Health Records; NDA = Nutrition and Dietetics Association.

3.4. Quality Assessment of Included Studies

Quantitative observational studies were appraised using the NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies. Based on predefined criteria, studies were categorized as high, moderate, or low quality. Overall, most quantitative studies were rated as moderate to high quality, with common limitations including small sample sizes and lack of blinding. The results of the quantitative quality assessment are presented in Table 5.

Qualitative studies were appraised using the Critical Appraisal Skills Programme (CASP) checklist. These studies generally demonstrated moderate to high methodological rigor; however, common limitations included limited reporting of researcher reflexivity and insufficient detail regarding data analysis procedures.

Table 5. Quality assessment of quantitative observational studies (NIH Tool).

Authors (Ref)	**YES**	**NO**	**NR**	**NA**	**Total Applicable**	**Quality Score (%)**	**Quality Rating**
Alkhaldy et al. [7]	7	6	1	0	14	50.0	Moderate
Kim and Baek [8]	8	5	1	0	14	57.1	Moderate
Lövestam , Steiber, et al. [9]	12	2	0	0	14	85.7	High
Lövestam, Vivanti et al. [10]	8	5	1	0	14	57.1	Moderate
O’Sullivan, Lo and Vivanti [11]	8	4	2	0	14	57.1	Moderate
Vivanti, Lewis and O’Sullivan [12]	10	3	0	1	13	76.9	High
O’Sullivan [15]	7	4	1	0	12	58.3	Moderate
Porter et al. [17]	9	4	1	0	14	64.3	Moderate

Note: YES = criterion satisfied; NO = criterion not satisfied; NR = not reported; NA = not applicable. Total applicable refers to the number of criteria relevant to each study. Quality scores (%) were calculated as the proportion of satisfied criteria out of the total applicable items. Studies were categorized as high (≥75%), moderate (50–74%), or low (<50%) quality based on these scores. The NIH Quality Assessment Tool was applied only to quantitative observational studies.

Overall, the included studies presented a moderate risk of bias. Common methodological concerns included lack of sample size justification, absence of blinding, and limited adjustment for potential confounding variables. In addition, several studies did not clearly report handling of missing data or other potential sources of bias. These limitations were more pronounced in lower-rated studies, whereas higher-quality studies demonstrated more robust methodological approaches.

3.5. Narrative Synthesis of Key Findings

Given the methodological heterogeneity of the included studies, a narrative synthesis approach was employed without statistical pooling. Findings were summarized descriptively across studies, and reported statistical significance was interpreted within the context of individual studies, without direct cross-study comparison.

Across the included studies, several recurring enablers of NCP implementation were identified. These included support from national dietetic associations, access to electronic health records (EHRs), and the availability of peer support or structured mentorship programs.

Commonly reported barriers included lack of formal training or education, time constraints, and limited technological infrastructure.

These findings are summarized in Figure 1. Frequencies represent the number of studies reporting each barrier or facilitator, with each study contributing once to the analysis.

3.6. Multinational Implementation Studies

Lövestam et al. [9] assessed the level of implementation of NCP and NCPT across 10 countries (Australia, Canada, Greece, Switzerland, Ireland, Denmark, New Zealand, the United States, Sweden, and Norway). An online, validated survey was distributed to dietitians across participating countries, where the NCP/ NCPT had been introduced at different timelines, between 2009 and 2014. The survey was composed of four modules, each of which was statistically analyzed independently. Only Module 1 (demographic characteristics, n = 6459) and Module 2 (NCP/NCPT implementation, n = 5255) were discussed in said publication. Sample characteristics differed because of the multinational concept of the study. Differences include sample size variability and the NCP/NCPT implementation strategy applied per country. Participants who reported to be unaware of the NCP were directed to the end of the study and recorded as never using nor planning to use the NCP/NCPT. Although Greece was part of the study, they had not implemented the NCP/NCPT at that time and still have not as of this writing [18]. Thus, questions related to aspects from Module 3 have been removed from the version of the questionnaire distributed to participants from Greece.

Overall, the NCP was implemented either more frequently or for longer periods than the NCPT ($p < 0.001$). The NCP and NCPT were significantly more likely to be implemented in inpatient settings (81% and 61%, respectively) and in public health settings (54% and 28%, respectively) ($p < 0.0001$).

Module 3 (factors influencing NCP implementation, n = 5727) was published as part of a secondary analysis investigating the attitudes, barriers and enablers related to NCP across the 10 countries [10]. A National Dietetic Association (NDA) recommendation was identified as the strongest enabler (69%), followed by peer support (63%) and the availability of electronic health records (EHR) (55%). The magnitude of an NDA recommendation demonstrated significant variation across the participating nations. While 73% of the US participants cited it as determinant, only 44% of the Norwegian dietitians did, suggesting that the preparedness and infrastructural capacity of the NDA to support such directives are crucial for effective implementation. Dietitians in Greece were not asked about the current recommendations by the NDA or about the lack of training and education relating to the NCP. Overall, the time to implement the NCP was reported as the strongest barrier (39%), followed by inadequate training and knowledge (32%). Variability was observed in the perception of the time-intensive nature of the NCP and its training demands, with 85% and 77% of Norwegian participants, respectively, citing these issues, compared with only 49% and 16% of Australian and New Zealand participants, respectively.

Data collected from Module 3 of the original study by Lövestam et al. [17], were re-analyzed by Vinci et al. [16], isolating the German and French speaking dietitians in Switzerland. The sample size was reduced to 228 dietitians, representing the 19% of the dietitians in the country in 2012 (n = 144 German, n = 84 French speaking). Awareness of the NCP/NCPT was almost universal (99%) with frequent use of the two tools by the majority (72%). Peer support and NDA influence were the strongest enablers for NCP/NCPT implementation for both groups. Barriers were similar across both groups, such as time constraints, insufficient knowledge or training, EHR and financial limitations and more. Like previous results, NDA influence varied between German and French speakers (89% vs. 77%; $p < 0.05$). Other factors with significant variation between the two groups included access to EHR (81% German vs. 44% French speakers; $p < 0.001$) and workplace NCP use enforcement (75% German vs. 53% French speakers; $p < 0.05$).

There was significant variation in the rate of implementation between each NCP and NCPT step ($p < 0.001$ for each). Country of residence was a significant factor for NCP and NCPT implementation. With the United States as a reference country, all countries excluding Australia, reported a significantly lower level of implementation (New Zealand $p < 0.001$; Canada, Switzerland, Denmark, Sweden, Norway, Ireland and Greece $p < 0.0001$). These differences likely reflect the chronological order and methods through which NCP/NCPT were introduced, with the US adopting the tools in 2003 and Australia in 2009, whereas Greece has not yet implemented them as of this writing [11,18]. Level of education did not have a significant impact on implementation ($p = 0.253$). Each additional year since completing the dietetic training was associated with a decrease in the implementation rate ($p = 0.0001$). Dietitians working with inpatients, outpatients, in teaching-academic areas and in managerial positions had the highest implementation scores ($p < 0.0001$), compared to those working in the community, research, or not currently working as dietitians. Lower associations between practice settings and implementation rates were seen in consultation and business practice ($p = 0.007$), foodservice ($p = 0.004$), and other ($p = 0.001$), with the lowest from dietitians working in public health ($p < 0.0001$).

A key limitation of the original study, and consequently of its secondary analyses, is that the United States contributed the largest proportion of the sample, which may have skewed the statistical findings. Additionally, only half of the dietitians in Greece were aware of the NCP/NCPT, potentially biasing the results. Future studies should consider more carefully selected samples, considering awareness of the NCP/NCPT as part of the inclusion criteria to enhance comparability across countries and improve generalizability.

3.7. National-Level Insights: Sweden, Australia and New Zealand

Vivanti, Lewis and O'Sullivan [12] assessed the knowledge about and trends around NCPT, focusing on enabling or disenabling factors and related implementation. The study took place in Australia in two phases ($n = 218$ in 2011 and $n = 205$ in 2014) and included members of the national association. The participants were asked to complete a validated survey. The time-intensive nature of NCP/NCPT was the strongest disabling factor for both surveying years ($p = 0.84$, 40% in 2011 and 41% in 2014). Although there was a significantly higher level of NCP/NCPT knowledge (mean $p < 0.0175$) and improved familiarity with and confidence in using the NCP in 2014 ($p < 0.001$) compared to 2011, the time barrier persisted.

Paradoxically, although participants in 2014 acknowledge the advantages supporting the NCP use (improved interdisciplinary communication, patient care and critical thinking ($p < 0.001$)) a higher proportion of participants, compared to 2011, still do not see clear benefits in its use.

Despite the accepted benefits of NCP, there seems to be a potential disconnect between theoretical advantages and practical experience since its time-expensive process leads to implementation resistance ($p = 0.002$).

O'Sullivan, Lo and Vivanti [11], evaluated knowledge, familiarity and concerns related to NCPT as influencing factors for its implementation in the Asia-Pacific region, using the validated ASK NCP survey. The study was multinational including 377 dietitians, contributing to varying percentages of registered dietitians per locale (n = 209, 5% of registered professionals from Australia, n = 4, 7% of registered professionals from New Zealand, n = 51, 55% of registered professionals from Singapore, and n = 4 from Philippines, Indian and USA combined). Across the countries, 81.7% of the participants consider the NCP applicable to their practice, but only 65.1% currently use it. The NCP and IDNT is perceived as a useful tool for improving patient care (55%) but as inconvenient to implement (19.6%). Lack of training and support, and insufficient time, were the most reported reasons for resisting implementation of the NCP, each cited by 25.5% of respondents, followed by lack of knowledge (23.8%).

A secondary analysis of seven semi structured audiotaped focus groups (–n = 3–8 per group) was conducted by Lövestam, Bostrom and Orrevall [13], to document the experiences and factors related to NCP/NCPT implementation of 37 dietitians, across 13 workplaces in Sweden. The participants were familiar with the NCP/NCPT, with at least one year of practicing experience. For the illustration of the results, the dietitians were categorized into three cases, based on the workforce size (i.e., Case A for small hospitals, Case B for large hospitals, Case C for solitary dietitians). Findings are documented as testimonial data rather than analytical conclusions derived from numerical data. The findings focused on assessing how the implementation strategy and support around it; peer support and group acclimatization; availability and structure of HER; and evaluation objectives influence the NCP/NCPT implementation.

Case A introduced the NCP/NCPT after the manager's recommendation. The dietetics team saw the adaptation of NCP/NCPT as something innovative and interesting, that aligned with the diagnostic classification codes that they were already using for their EHR. Their interest to work on something new, made them oversee the difficult and time-consuming nature of NCP. Soon, the department developed their own guide with examples of problem-etiology-signs and symptoms (PES). In addition, the EHR system was formatted to include PES statements, and dietitians recommended the addition of preformatted sentences or drop-down lists. The evaluation objective for dietitians in Case A was to form a PES statement for every new patient. The goal was for 80% of those notes to include a PES statement. Peer support facilitated the acclimatization of NCP use and encouraged frequent discussions related to NCP.

Implementation of NCP/NCPT in Case B was also recommended by the manager. Dietitians that had been previously formally informed about NCP/NCPT, were designated as team leaders, leading frequent discussion meetings on NCP related topics. The evaluation goal was to write a PES statement for every new patient. Initially the NCP/NCPT was considered by many as complicated and unfit to their practice. Resistance to its implementation remained by some, as they continued to find it complex, time-intensive and ineffectual, regardless of the peer support from the leader team. At some point the discussion groups discontinued due to workforce changes that led to reduced implementation. However, during the same time, the EHR system was updated to include drop-down lists of PES statements, which made the implementation process easier and felt natural to their workflow.

The solitary dietitian represented in Case C, thought of implementing the NCP/NCPT herself, after attending some educational courses. She or her manager did not set an evaluation objective. However, for unspecified reasons she was never able to reach implementation stage. The EHR system used at her facility could not be updated to incorporate NCP related terminology. The lack of peer support, technological infrastructure and easily accessible resources made her resist the idea of implementing NCP/NCPT, as it was much faster for her to keep up with her usual handwriting notes [13].

For Cases A and B, the evaluation monitoring was discontinued for different reasons, therefore its contribution to NCP/NCPT implementation is not well understood by these findings. Incorporation of PES statements as pre-formulated sentences into the EHR for Cases A and B was a stronger facilitator compared to peer support. However, in Case C where EHR could not accommodate such pre-formulated statements, peer support could have been a strong facilitator.

A cross-sectional comparative study by Porter and Devine [17] surveyed 70 dietitians from five purposively selected hospitals, using the validated ASK NCP online survey. Two of those hospitals with at least one year of informal NCP implementation ("post-implementers") and three without prior implementation ("pre-implementers"). No inclusion criteria applied. The survey included multiple-choice, Likert-scale, and open-ended items assessing knowledge, familiarity, confidence, support, value, barriers, training, and education related to NCP and NCPT.

Statistically, post-implementers had significantly higher knowledge scores ($p < 0.05$), greater familiarity with NCP ($p < 0.01$), greater confidence to implement ($p < 0.01$), and greater perceived support for using NCP ($p \leq 0.001$) than pre-implementers. Overall, 96% of participants agreed that NCP/NCPT were applicable to practice, 93% valued NCP, 88% valued NCPT, 75% believed NCP/NCPT would improve patient care, and 74% felt they needed to change their practice. Among pre-implementers, 55% felt prepared to commence implementation, but 48% reported that implementation would be difficult or very difficult. Pre-implementers also reported significantly less training on NCP ($p \leq 0.001$), although 97% indicated that further training and support would increase their confidence to implement NCP. There was no significant difference between groups regarding general concerns about implementation.

Barrier profiles differed between groups. Pre-implementers most commonly identified lack of knowledge (n = 25), lack of training and support (n = 24), limited resources (n = 17), time constraints (n = 17), concerns about decreased productivity (n = 16), and difficulty formulating PES statements (n = 14). Post-implementers also reported time constraints (n = 4), as well as busy workloads and part-time work status as barriers; PES statements remained challenging in some contexts (n = 3). Qualitative themes highlighted that successful implementation depended on allocated time for practice and regular tutorials (n = 8), leadership and support from managers and local NCP leaders (n = 6), and professional motivation through understanding the benefits of change (n = 5). The findings were subsequently used to justify development of an implementation package guided by Kotter's eight-stage change model.

The previous study informed the development of an implementation package, which was later evaluated in the study by Porter, Devine and O'Sullivan [14]. They recruited a control group/ hospital (n = 11) and two test groups/ hospitals (n = 24). Three dietitians from each group were assigned as team leaders to coordinate and support the NCP/NCPT implementation. Both groups were asked to complete a validated survey pre (n = 35 total; n = 24 test groups; n = 11 control group) and post (n = 23 total; n = 14 test groups; n = 9 control group) NCP implementation, to collect information on knowledge, attitudes, and facilitating factors relating to NCP/NCPT. In addition, focus groups were conducted for the test sites after NCP implementation (n = 11 total, from both test groups). The dietitians from the control hospital were free to choose their implementation strategy. The dietitians from the test group received an eight-stage implementation strategy that was expected to conclude in 5 months (only seven stages were evaluated in the results). Pre- and post-implementation comparisons between the groups were insignificant for knowledge ($p = 0.277$) and familiarity ($p = 0.804$), while significantly higher for within the test groups (knowledge $p < 0.01$ and familiarity $p = 0.025$). Post implementation confidence between the groups was insignificant ($p = 0.305$), while a significant increase in confidence score, post- implementation, was observed within the test group ($p = 0.011$). Additionally, the test group was significantly more confident in using the NCPT in their practice ($p = 0.026$), they were significantly more likely to make a correct nutrition diagnosis ($p = 0.034$) and develop an appropriate PES statement ($p = 0.034$). Post-implementation perceptions within the control group, related to the applicability or value of the NCP/NCPT in their clinical practice, were significantly worse (p = 0.046). The time needed to complete the NCP/NCPT was similar between (p = 0.324) and within pre- and post-implementation group comparisons (test group p = 0.564; control group p = 0.317).

Overall, these findings suggest that exposure to NCP implementation is a stronger predictor of knowledge and confidence than the specific method used to introduce it. They also indicate that while the time allocated for adaptation may support confidence and familiarity, it does not necessarily improve the time it takes to complete the process.

3.8. Case Studies in Asia and the Middle East

A study conducted by Kim and Baek [8], recruited 35 clinical nutrition managers of Korean general tertiary (n = 24) and secondary (n = 11) care hospitals. Nine of those managers were from hospitals that were already implementing the NCP, while n = 26 from hospitals without prior implementation. Overall, 91.4% (n = 32; 100%/n = 9 from hospitals implementing, 88.5%/n = 23 from hospitals not implementing) were aware of the NCP/IDNT. While overall 96.9% (n = 31) received some sort of education/training about NCP/NCPT, their self-reported knowledge on the NCP varied (hospitals implementing/not implementing respectively: n = 1/n = 0 "very well", n = 5/n = 3 "well", n = 2/n = 12 "so-so", n = 1/n = 8 "poor"). Similar trends were observed for the NCPT knowledge (hospitals implementing / not implementing respectively: n = 1/n = 0 "very well", n = 4/n = 1 "well", n = 3/n = 8 "so-so", n = 0/n = 14 "poor"; n = 0/n = 1 "very poor"). The lack of knowledge is perceived as a restraining factor for NCP implementation for 66.7% (n = 6) of the dietitians from hospitals implementing it and as a factor to avoid implementation for 53.8% (n = 14) of the dietitians from hospitals not implementing it.

The NCP was described as time-intensive by 66.7% (n = 6) of the participants from hospitals implementing the NCP, mainly because of the changes they had to make to accommodate its implementation. Similar findings were observed from the participants from hospitals not currently implementing it, with 69.2% (n = 18) considering its introduction as challenging due to constraints relating to time and human resources. Benefits observed among hospital dietitians implementing the NCP included less difficulty in the decision-making process for forming a nutrition therapy plan (88.9%; n = 8), improved quality of nutrition therapy (77.8%; n = 7), more consistent performance among colleagues (55.6%, n = 5), and improved team communication (44.4%, n = 4).

A study by Alkhaldy et al. [7] included 56 dietitians across six hospitals in Jeddah, Saudi Arabia. The study had a cross-sectional design and included the questionnaire that was developed by Kim and Baek [8], with some modifications. All but one dietitian were aware of NCP. Despite the low percentage that reported to have received training on how to use the NCP (26.8%), 35.3% (n = 18) and 25.5% (n = 13) of them consider themselves to be excellent or very good users of NCP respectively, and just two to be fair users. Five dietitians were not users of the NCP. A small workforce size was the strongest barrier for NCP use (40.9%, n = 9). Other barriers were the lack of experience and knowledge (36.4%, n = 8) and the interference of NCP implementation with their usual workflow (22.7%, n = 5). Participants did not find the NCP to be time-consuming or difficult to complete.

3.9. Institutional and Prototype Evaluation

O'Sullivan [15] created an electronic prototype using the NCP format and its relative steps, with the addition of a section called "client history". The prototype incorporated preformatted diagnoses and intervention dialogs, to choose from as appropriate. The "monitor and evaluation" step of the NCP was not tested in the pilot study due to budget constraints. The study included different methods of assessment such as questionnaires, pre- and post-statistical analysis (n = 12) and an audio-recorded focus group (n = 7) that incorporated a case study. Some of the benefits of using the NCPT, as identified by the twelve participants, were the standardization across health record notes (83%) and the systematic approach between the dietitians (75%). On the other hand, 86% of the participants identified the lack of education and training as the strongest barrier for using NCP/IDNT, followed by the time-intensive nature of the tool (14%).

When the prototype electronic health record form was adopted, confidence in using the NCP increased by 17%. Participants consistently preferred the electronic IDNT over the paper version due to its ease of use, retrospective accessibility integration with electronic health records and time efficacy. Initial barriers such as access to a computer, early-stage adjustment and security concerns were considered manageable, especially when GDPR requirements were enforced. The prototype was also considered appropriate as a training tool, with 50% of the participants reporting that it reduces training time through step-by-step menus and facilitates critical thinking. Overall, 65% of the participants are more likely to adopt the electronic IDNT, while 35% felt it did not make any difference and 8% believed it could reduce adoption.

3.10. Regional Patterns of NCP Format

An overview of manual versus software-based NCP use across regions is presented in Figure 2. Data are summarized at the study level, with studies categorized according to their primary reported implementation context.

Electronic formats were more frequently reported in studies conducted in countries such as the United States and Australia, whereas manual documentation was more commonly described in studies from Republic of Korea and Saudi Arabia. These observations suggest potential regional variation in NCP implementation approaches.

However, these findings are based on a limited number of heterogeneous, predominantly observational studies and should be interpreted with caution. Differences may be influenced by factors such as infrastructure, digital readiness, and health system characteristics, although these were not consistently assessed across studies.

Based on the consistency, frequency, and methodological quality of the included studies, the strength of evidence for key findings was qualitatively assessed. Strong evidence was identified for barriers such as lack of training and time constraints, as well as facilitators including support from national dietetic associations and access to electronic health records, which were consistently reported across multiple studies. Moderate evidence supported the role of peer collaboration and technological infrastructure, with some variability across settings. In contrast, evidence regarding the impact of NCP implementation on patient outcomes was limited and indirect, and therefore considered weak.

4. Discussion

Environmental limitations, including insufficient training and technological infrastructure constraints, were frequently reported as barriers to NCP implementation across settings. Conversely, support from national dietetic associations, peer collaboration, and access to electronic health records (EHRs) were commonly identified as key facilitators.

In studies where EHR systems were available and adaptable to incorporate the NCP, implementation was more frequently reported and was often described as being associated with improved documentation practices, increased practitioner confidence, and enhanced workflow efficiency. However, these findings are based primarily on observational and self-reported data and should be interpreted with caution. In contrast, manual or paper-based use of the NCP/NCPT was commonly described as complex and time-consuming.

Figure 1a,b summarize the most frequently reported barriers and facilitators across the included studies, based on study-level aggregation. While similar factors were reported across different geographic contexts, the limited number and heterogeneity of studies restrict the ability to draw definitive conclusions regarding their relative importance.

Regional variation in NCP format use was also observed. Studies from the United States and Australia more frequently reported the use of software-based formats, whereas studies from

Republic of Korea and Saudi Arabia more commonly described reliance on manual documentation (Figure 2). These observations suggest potential contextual differences in implementation; however, they should be interpreted cautiously, as underlying factors such as infrastructure, digital readiness, and health system characteristics were not consistently assessed across studies.

The synthesis of outcomes across included studies (Table 3) highlights recurring patterns in the implementation of the Nutrition Care Process (NCP) across diverse settings. Barriers such as lack of training, time constraints, and limited technological infrastructure were frequently reported, suggesting that implementation challenges may be influenced by common systemic factors. Similarly, facilitators including support from national dietetic associations, peer collaboration, and access to electronic health records were commonly identified, underscoring the potential role of organizational and professional support structures.

Despite variability in study design and geographical context, similar findings were reported across multiple studies. However, given the predominance of observational and qualitative designs, these findings should be interpreted cautiously and are indicative of associations rather than causal relationships.

The comparison between manual and electronic NCP implementation formats (Table 4) provides further insight into potential influences on clinical practice. Electronic formats were frequently described as supporting improved documentation practices, workflow efficiency, and practitioner confidence, often attributed to structured templates and integration within electronic health record systems. In contrast, manual approaches were commonly reported as more time-intensive and less standardized.

However, these observations are largely based on non-comparative and self-reported data. Both formats were affected by similar barriers, including limited training and time constraints, suggesting that implementation is influenced by multiple contextual factors beyond format alone. While electronic formats may offer practical advantages, the current evidence remains limited and indirect, and does not support definitive conclusions regarding their superiority or impact on patient-level outcomes.

Differences observed across countries suggest that NCP implementation is strongly influenced by contextual factors, including the timing of adoption, availability of technological infrastructure, and the level of support from national dietetic associations. Countries with earlier adoption and stronger institutional support, such as the United States and Australia, demonstrated higher levels of implementation and integration of electronic formats. In contrast, lower adoption rates in other regions may reflect limited training opportunities, resource constraints, or lack of formal implementation strategies. These findings highlight the importance of context-specific approaches to NCP implementation rather than a uniform global strategy.

Given the scarcity of directly comparable studies in the nutrition and dietetics field, evidence from adjacent healthcare professions, particularly nursing, was consulted for triangulation. For example, a documentation audit study by Wang et al. [19] in the nursing context found that electronic documentation formats resulted in significantly higher completeness and comprehensiveness than paper-based formats. While causality could not be established, the structured design of electronic templates appeared to enhance both the depth and reliability of recorded data (score: 4/4 vs. 3.52/4, $p < 0.01$). Notably, nurses documented more frequently using the electronic format, which facilitated improved care planning. In contrast, dietitians often work independently, and their documentation, though critical, may not be as operationally mandatory as in nursing shifts, potentially contributing to underutilization.

Previous studies in nursing have demonstrated higher levels of compliance with standardized documentation systems, often attributed to their integration within routine clinical workflows. For example, a randomized clinical trial by Ammenwerth et al. [20] showed that computer-based nursing documentation significantly improved the legibility, completeness, and overall quality of care plans, despite a slight increase in time required due to greater documentation detail.

In contrast, dietetic practice may involve more variability in documentation requirements and less structured integration within healthcare systems. Unlike nursing, where documentation is often mandatory and embedded within routine workflows, the Nutrition Care Process (NCP) may not be consistently enforced or supported at a system level. This difference in operational context may contribute to lower and more variable adoption of the NCP across settings.

Together, these findings suggest that while electronic documentation systems may support improved quality and consistency, successful implementation of the NCP likely depends not only on technological solutions but also on stronger institutional mandates and integration into routine clinical workflows.

A more recent investigation by Tomasi et al. [21] evaluated the electronic and manual formats of the Bedside Paediatric Early Warning System (BedsidePEWS). In simulations, the electronic format led to 15.7% fewer scoring errors and improved decision-making accuracy compared to paper-based tools ($p < 0.005$).

Moreover, Snowdon et al. [22] compared the traditional and electronic Montreal Cognitive Assessment (MoCA vs. eMoCA) in a self-administered setting. While the electronic format required more time to complete (likely due to guided, audio-assisted delivery), it improved test completion and reduced errors due to skipped items—highlighting the role of digital design in enhancing data quality and patient experience.

4.1. Strengths and Limitations of the Included Studies

The methodological quality of the included studies was generally moderate, with only a small number meeting criteria for high-quality ratings. Common limitations included a lack of sample size justification, absence of blinding in outcome assessment, and insufficient adjustment for potential confounding variables. In several studies, the handling of missing data and other potential sources of bias were not clearly reported.

This review is also subject to several limitations. The restriction to studies published in English and Greek may have introduced language bias. Although the search strategy included Greek-language publications, no eligible studies were identified, which may indicate limited published evidence in this context or potential publication bias. Additionally, the inclusion of heterogeneous study designs, populations, and outcome measures limited the feasibility of conducting a quantitative synthesis or meta-analysis. Variability in study objectives—particularly differences between studies focusing on implementation processes versus format comparisons—may have further affected the consistency and comparability of findings.

The overall risk of bias within the included studies may have influenced the strength and reliability of the conclusions, as the predominance of observational and qualitative designs restricts the ability to establish causal relationships. Accordingly, the findings should be interpreted with caution, particularly where evidence is derived from lower-quality studies. Nevertheless, the consistency of key findings across studies of varying methodological quality provides some support for the robustness of the identified barriers and facilitators.

In addition, the possibility of reporting bias cannot be excluded, as no formal assessment (e.g., funnel plot analysis) was conducted due to the heterogeneity and limited number of included studies. Furthermore, the absence of a formal GRADE assessment may limit the interpretability of the certainty of evidence; however, a structured qualitative approach was applied to provide an overall indication of evidence strength.

4.2. Implications for Practice and Policy

The findings of this review highlight the need for tailored strategies to support NCP implementation in various healthcare contexts. Interventions should focus on training and education, especially in regions where formal NCP instruction is lacking.

Integrating NCP/NCPT into existing electronic health record systems (EHRs) appears to be a highly effective enabler. Therefore, healthcare administrators and national dietetic associations (NDAs) should prioritize funding and policy development to facilitate digital integration.

Additionally, promoting peer support models and standardized implementation frameworks may enhance uptake, especially in resource-limited settings or where individual dietitians work in isolation.

4.3. Recommendations for Future Research

Future research should explore the longitudinal impact of NCP/NCPT implementation on patient-related outcomes, beyond implementation metrics such as documentation quality or practitioner satisfaction.

There is a need for high-quality interventional studies, including randomized controlled trials (RCTs) and controlled before–after studies, to evaluate the effectiveness of NCP training programs, electronic health record (EHR) integration, and policy-level interventions.

Further research is also required in underrepresented regions, including Eastern Europe, the Middle East, and parts of Asia and Africa, to better understand context-specific barriers and facilitators within diverse healthcare systems.

5. Conclusions

This systematic review highlights the potential value of standardized clinical frameworks, such as the Nutrition Care Process (NCP) and Nutrition Care Process Terminology (NCPT), in supporting consistency and structure in dietetic practice. The findings suggest that implementation of these tools may contribute to improved documentation practices and more standardized approaches to patient care; however, the strength of this evidence is limited by the predominantly observational and heterogeneous nature of the included studies.

Across diverse healthcare settings, electronic integration of the NCP within electronic health records (EHRs) was frequently reported as a facilitating factor for implementation, particularly when combined with institutional support and professional training. Conversely, manual or paper-based approaches were often described as more challenging to implement. However, these observations are largely based on non-comparative and self-reported data, and should therefore be interpreted with caution.

Overall, the evidence indicates that digital formats may offer practical advantages in supporting NCP adoption, but the current literature remains limited, context-dependent, and lacks robust comparative and patient-level outcome data. As such, definitive conclusions regarding the superiority of electronic over manual formats cannot be drawn.

Future efforts should focus on strengthening the evidence base through well-designed comparative and implementation studies, as well as on developing context-sensitive strategies, including training, institutional support, and appropriate digital infrastructure.

In conclusion, while this review provides a global overview of barriers and facilitators to NCP implementation, further high-quality research is required to better understand how different implementation approaches influence clinical practice and patient outcomes.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/doi/file s1: Completed PRISMA 2020 checklist; Table S2: Full search strategies for all databases used in the systematic review

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Abbreviations

The following abbreviations are used in this manuscript:

CCP(s)	Clinical Care Process(es)
EHR	Electronic health record
EMBASE	Excerpta medica database
IDNT	International dietetics and nutrition terminology
MEDLINE	Medical literature analysis and retrieval system online
NCP	Nutrition Care Process
NCPT	Nutrition Care Process Terminology

NDA	National dietetic association
NIH	National heart, lung, and blood institute
PES	Problem, etiology, signs and symptoms
PICOS	Participants, interventions, comparison, outcomes, study design
PRISMA	Preferred reporting items for systematic reviews and meta-analyses

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Appendix XI: Manuscript of expert validation, with embedded training components, questionnaire results (Phase 2 of a 3 Phases study).

Development and Content Validation of a Greek Electronic Tool for the Process for Nutrition and Dietetic Practice (e-PNDP): A Mixed-Methods Study in Cyprus

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Abstract

Background:
Standardised documentation frameworks such as the Nutrition Care Process (NCP) and the Process for Nutrition and Dietetic Practice (PNDP) aim to improve consistency of clinical reasoning, transparency of decision-making, and patient-centred care in dietetics. However, implementation remains inconsistent and is often limited by time constraints, insufficient applied training, and inadequate integration within digital health systems.

Methods:
A sequential three-phase mixed-methods design was employed to develop and validate a Greek electronic PNDP tool (e-PNDP) for routine dietetic practice in Cyprus. In Phase 1, an exploratory national web-based survey was conducted among nutrition and dietetic professionals (n = 63) to examine awareness, implementation patterns, and perceived barriers related to structured documentation. In Phase 2, the electronic PNDP tool was developed based on these findings and aligned with the PNDP framework. In Phase 3, the tool underwent expert

content validation and usability evaluation by a purposive multidisciplinary panel (n = 7). Panel members rated relevance, clarity, and simplicity using a 5-point Likert scale, and item-level and scale-level content validity indices (I-CVI and S-CVI) were calculated.

Results:
Survey findings demonstrated high awareness of structured documentation frameworks but variability in sustained implementation, with time burden and challenges in nutrition diagnosis formulation identified as key barriers. Expert evaluation indicated strong content validity across tool modules (I-CVI range: 0.86–1.00; S-CVI/Ave = 0.92) and consistently high usability ratings for relevance, clarity, and simplicity. Qualitative feedback suggested minor refinements related to wording clarity, interface presentation, and inclusion of selected clinical fields, without requiring structural modifications to the PNDP framework.

Conclusions:
The electronic PNDP tool (e-PNDP) demonstrated strong content validity and usability, supporting its feasibility as a structured documentation solution within the Cypriot healthcare context. Integration within existing digital workflows and targeted training—particularly in nutrition diagnosis formulation—may enhance sustainable implementation and contribute to improved transparency and standardisation of dietetic documentation.

Keywords: Nutrition Care Process; Process for Nutrition and Dietetic Practice; dietetic documentation; electronic health records; digital health

Introduction

Standardised frameworks are central to delivering consistent, patient-centred nutrition care and to making clinical reasoning visible through clear and systematic documentation. Such frameworks exist within the field of nutrition and dietetics, most notably the Nutrition Care Process (NCP) and its derivative counterpart, the Process for Nutrition and Dietetic Practice (PNDP). These frameworks comprise structured stages—assessment, diagnosis, intervention, and monitoring and evaluation—which support evidence-based practice and accountable clinical decision-making (1,2). Both are embedded within international professional standards (3–5).

While the NCP and PNDP provide structured models for clinical reasoning and care delivery, documentation represents only one component of these frameworks, serving as the mechanism through which clinical decisions are recorded and communicated. However, implementation remains uneven across settings and countries, with persistent barriers including time constraints, limited applied training, variable professional support, and insufficient integration within digital health systems (6,7). Across international dietetic contexts, these barriers are frequently associated with manual documentation formats, whereas electronic implementation—particularly integration into electronic health records (EHRs)—has been consistently linked to improved adoption (6,8,9). Specifically, the use of predefined templates, guided diagnostic structures such as PES statements, and standardised terminology within EHRs has been associated with improved documentation clarity, workflow efficiency, auditability, and practitioner confidence.

A critical component of structured documentation is the use of standardised language (SL), which underpins consistency, comparability, and clarity in clinical communication. Despite its recognised importance, SL adoption remains variable and is often insufficiently integrated into routine practice.

Beyond structural and technological barriers, implementation of structured documentation frameworks is influenced by a broader range of factors, including practitioner attitudes, behavioural capability, organisational culture, and institutional support. Evidence from implementation science highlights that successful adoption depends not only on tool availability but also on motivation, perceived usefulness, workflow integration, and the presence of supportive training environments. Additionally, interprofessional dynamics and system-level priorities may further influence the extent to which structured documentation is consistently applied in clinical practice.(9).

Within the Cypriot healthcare context, these challenges are compounded by the absence of locally developed and validated electronic tools aligned specifically with the PNDP framework. Although electronic record-keeping platforms exist in both public and private sectors, documentation typically relies on unrestricted free-text entry without predefined PNDP structure. This contributes to variability in practice, reduced comparability across practitioners, and limited capacity for systematic monitoring of documentation quality or care outcomes (10). In this context, the developed tool was designed to be compatible with general clinical documentation requirements within the GHS framework, thereby supporting potential integration into existing healthcare systems.

The organisation of nutrition and dietetic services in Cyprus spans both the public and private healthcare sectors. Within the public system, services are primarily delivered through the General Health System (GHS), which provides universal coverage and includes dietetic services across primary care, outpatient clinics, and hospital settings. However, a substantial proportion of dietitians also operate in private practice, often independently or within multidisciplinary clinics.

Documentation practices vary across settings, with limited standardisation and frequent reliance on unstructured or semi-structured formats. While electronic health record systems are implemented within the GHS, these do not currently incorporate structured PNDP-aligned templates. In private practice, documentation is often maintained using standalone digital tools or paper-based records. To date, no unified legal or regulatory framework mandates a standardised structure for dietetic documentation, further contributing to variability in practice.

These patterns are especially relevant in Cyprus, where structured digital tools for PNDP are not yet validated and documentation capabilities within existing systems may be constrained. Against this background, the present study describes the development and validation of an electronic PNDP format, aiming to produce a usable, standardised documentation solution aligned with professional frameworks and responsive to real-world barriers identified in implementation research.

Despite increasing international and local recognition of the PNDP framework, several critical gaps remain evident in both the literature and clinical practice. First, substantial variability in structured PNDP documentation persists within national contexts such as Cyprus, where implementation patterns have not been systematically examined. Second, although digital integration of structured documentation frameworks is consistently associated with improved documentation quality, sustainability, and workflow efficiency, no locally developed or validated electronic PNDP tools currently exist in the Greek language tailored to the Cypriot healthcare system. Third, documentation format has rarely been conceptualised as an independent implementation determinant influencing clinical reasoning transparency, adoption fidelity, and professional visibility.

To ensure relevance to real-world clinical conditions in Cyprus, the development of the eΔΔΔΦwas preceded by a national baseline needs assessment. This exploratory phase systematically examined awareness, knowledge, and implementation patterns of structured documentation processes among nutrition and dietetic professionals. Findings from this assessment confirm variability in sustained PNDP use, and associated barriers to its implementation such as diagnosis-related challenges, time constraints, and incomplete digital structuring within existing documentation systems. These insights directly informed the structural design, diagnostic scaffolding, and usability priorities of the development of the Greek electronic PNDP tool (eΔΔΔΦ), ensuring that its development was grounded in identified implementation needs rather than theoretical assumptions.

Finally, methodological approaches within the existing literature have predominantly relied on cross-sectional surveys assessing awareness or attitudes, with limited multi-phase development studies integrating empirical needs assessment with structured digital tool design, formal content validation, and usability evaluation.

Addressing these interconnected gaps across practice, digital infrastructure, conceptual alignment and methodology, requires an empirically informed, context sensitive approach. Accordingly, the aim of this study was to develop and formally validate a Greek electronic PNDP tool (e-ΔΔΔΦ or e-PNDP; used interchangeably), grounded in a national baseline needs assessment and evaluated through structured expert consensus, to ensure contextual relevance, structural clarity, and implementation feasibility within the Cypriot healthcare system.

Methods

This study employed a sequential multi-phase design grounded in a pragmatic research philosophy. Pragmatism was selected as it enables the integration of quantitative and qualitative approaches to address applied research questions related to implementation and usability. The study combined an exploratory needs assessment, structured development of a digital documentation tool (e-ΔΔΔΦ), and formal expert content validation with training to ensure both empirical grounding and methodological rigor.

The research was conducted in three consecutive phases:

• Phase 1: Exploratory national needs assessment of PNDP knowledge and implementation patterns

• Phase 2: Development of a Greek electronic PNDP tool (e-ΔΔΔΦ)

• Phase 3: Expert content validation and usability evaluation through training

This phased design enabled identification of implementation needs, development of a context-adapted digital documentation tool, and its subsequent validation by domain experts. The overall study design and development process of the electronic PNDP tool are illustrated in the graphical abstract and in Figure 1.

Phase 1 – Exploratory National Needs Assessment

Study Design, Participants and Recruitment

Phase 1 employed an exploratory cross-sectional web-based survey to assess national awareness, knowledge, and implementation patterns of the Process for Nutrition and Dietetic

Practice (PNDP) among nutrition and dietetic professionals in Cyprus, with particular attention to structural documentation gaps in routine practice. The questionnaire was developed by the research team and informed by established professional frameworks, including the Nutrition Care Process (NCP) model of the Academy of Nutrition and Dietetics, which comprises the four stages of assessment, diagnosis, intervention, and monitoring and evaluation (5),(2). Additional guidance was drawn from the PNDP framework published by the British Dietetic Association (BDA), which operationalises NCP principles within European practice contexts, as well as documentation harmonisation initiatives promoted by the European Federation of the Associations of Dietitians (EFAD). Item development was further informed by published implementation research examining facilitators and barriers to the adoption of structured documentation processes in dietetic practice (9).

Although recruitment was conducted at a national level, the achieved sample is not intended to be statistically representative of the entire professional population. The sample predominantly reflects early-career professionals, including postgraduate trainees, and therefore provides insight into emerging practice patterns rather than fully established national trends.

2.1.2 Development of the Phase 1 Instrument (National Needs Assessment)

The questionnaire was conceptually grounded in established professional frameworks and adapted linguistically and operationally to the Cypriot healthcare context. As the instrument was developed for exploratory needs assessment, it was not designed as a psychometrically validated scale. The questionnaire was pilot tested with five dietitians to ensure clarity and content relevance prior to distribution.

The questionnaire was developed in Greek to ensure linguistic and contextual appropriateness for the target population. The full instrument is provided as Supplementary Material in its original language. To facilitate reproducibility, the questionnaire structure, domains, and response formats are described below.

The instrument consisted of multiple sections designed to capture both quantitative and qualitative data. These included: (i) demographic and professional characteristics; (ii) familiarity with structured documentation frameworks (PNDP, NCP, and SOAP); (iii) self-perceived knowledge of documentation processes; (iv) extent of implementation in routine practice; and (v) perceived barriers, facilitators, and step-specific challenges across the PNDP stages (assessment, diagnosis, intervention, and monitoring and evaluation).

Items were structured using categorical, multiple-choice, Likert-type, and open-ended formats to capture both quantitative implementation patterns and qualitative contextual insights. The estimated completion time was approximately 5–10 minutes.

Participants were recruited using convenience sampling through dissemination channels including the Cyprus Nutrition and Dietetic Association (CyDNA), professional mailing lists, and targeted posts on professional social media platforms. The survey was administered via Google Forms and distributed through a QR code or direct link. Participation was voluntary and responses were collected anonymously unless participants opted to provide contact details for follow-up phases.

Data collection was conducted between 28 November 2022 and 10 May 2025. Recruitment was implemented in two waves to increase participation within the relatively small professional population of nutrition and dietetic practitioners in Cyprus, while maintaining identical survey instruments and dissemination procedures. A total of 63 complete responses were obtained and included in the analysis.

Survey data were exported from Google Forms and analysed using IBM SPSS Statistics (version 27). Descriptive statistics were used to summarise frequencies and proportions. Due to the modest sample size and sparse contingency tables, associations between categorical variables were examined using Fisher–Freeman–Halton exact tests with Monte Carlo estimation (10,000 replications; 99% confidence interval). Effect sizes were calculated using Cramer's V, with statistical significance set at $p < 0.05$. Adjustments for multiple comparisons were applied using Bonferroni correction or the Benjamini–Hochberg procedure where appropriate.

Open-ended responses were analysed using descriptive thematic coding to identify recurring themes related to documentation practices and barriers. When participants endorsed multiple themes, binary coding (1 = selected; 0 = not selected) was used to map frequencies. Composite responses were excluded from individual category counts to avoid inflation of frequencies, and crosstabulations were used descriptively where assumptions for inferential testing were not met.

Findings from Phase 1 were used to identify implementation needs and inform the development of the electronic PNDP tool (e-PNDP) in Phase 2, rather than to generate nationally representative estimates of practice patterns.

Phase 2 – Development of the Greek electronic PNDP Tool (e-ΔΔΔΦ)

Phase 2 involved the structured development of the e-ΔΔΔΦ, designed to operationalise the Process for Nutrition and Dietetic Practice (PNDP) within the Cypriot healthcare context. The development process followed a user-informed and implementation-oriented approach, integrating empirical findings from Phase 1 with established PNDP framework principles to ensure contextual relevance, conceptual fidelity, and practical usability.

The development of the e-ΔΔΔΦ preserved full alignment with the four-step PNDP framework—assessment, diagnosis, intervention, and monitoring and evaluation—while translating its sequential reasoning into a structured digital documentation format that reflects routine clinical decision-making processes rather than isolated data entry. Particular emphasis was placed on usability-oriented simplicity to facilitate completion within realistic consultation timeframes and reduce documentation burden identified during the Phase 1 needs assessment.

Greek linguistic adaptation of the e-ΔΔΔΦ constructs was undertaken to ensure terminological accuracy and professional appropriateness within the local practice environment, while maintaining conceptual equivalence with the original NCP/PNDP terminology.

Modular data-entry fields were incorporated to capture anthropometric, biochemical, clinical, and dietary domains in a structured and standardised manner. Structured PAS (Problem–Aetiology–Signs/Symptoms) options were embedded within the diagnostic component to support systematic formulation of nutrition diagnoses and clinical reasoning. Free-text fields were intentionally limited to reduce documentation variability and cognitive burden while retaining limited narrative flexibility where contextual clinical explanations were required.

The resulting prototype was developed as a standalone digital documentation tool with potential scalability and future integration into the national electronic health record (EHR) infrastructure of the Cyprus General Health System (GHS). Although not directly embedded within the GHS platform, the tool was designed to support interoperability and structured data extraction for future audit, quality monitoring, and outcome evaluation through generation of a standardized PDF documentation output compatible with existing patient record systems.

In addition to alignment with the PNDP framework, the development process was informed by international best practices in structured clinical documentation and digital health tool design, including principles of usability, interoperability, and standardised terminology integration. This ensured that the tool is not only contextually relevant but also consistent with broader international trends in digital dietetic practice.

2.2.1 Technical Architecture of the e-ΔΔΔΦ Tool

The e-ΔΔΔΦ tool was developed as a structured electronic documentation template designed to operationalise the sequential logic of the Process for Nutrition and Dietetic Practice (PNDP) within routine clinical workflows. The prototype consists of a modular digital form in which data-entry fields correspond to the four PNDP stages: assessment, diagnosis, intervention, and monitoring and evaluation.

Structured input fields and predefined response options were incorporated to guide systematic documentation and reduce reliance on unrestricted free-text entries while retaining limited narrative fields for contextual clinical notes where necessary. Information entered by the practitioner is organised into predefined sections that automatically generate a structured summary of the nutrition care process.

Completed documentation can be exported as a standardized PDF file, enabling storage within patient records and facilitating upload into existing electronic health record systems of the Cyprus General Health System (GHS). The design prioritised usability and compatibility with existing documentation workflows while allowing potential future integration into broader digital health infrastructures.

Phase 3 – Expert Content Validation and Usability Evaluation

A purposive expert panel was recruited to evaluate the content validity and usability of the e-ΔΔΔΦ tool through an online survey with embedded training components distributed via Google Forms. Purposive sampling was used to ensure that participants possessed advanced professional expertise and familiarity with structured documentation frameworks.

Eligibility criteria required experts to be: (a) registered dietitians or nutritionists with a minimum of five years of clinical experience and demonstrated familiarity with the PNDP framework and its diagnostic logic; (b) professionals involved in academic or leadership roles relevant to nutrition and health sciences (e.g., immunologists, statisticians, biochemists); or (c) professionals with advanced roles in the field of nutrition and dietetics. This approach ensured that evaluations reflected both practical clinical experience and broader professional oversight perspectives.

Experts were selected using purposive sampling to ensure inclusion of individuals with advanced knowledge of structured documentation frameworks and their clinical application. To enhance the breadth of perspectives and reduce potential selection bias, the panel included professionals from diverse roles, including clinical practice, academia, and related health sciences. While purposive sampling may introduce selection bias, it is considered appropriate for content validation studies where domain-specific expertise is required.

The validation survey was conducted between January and February 2026. As with Phase 1, because the survey platform (Google Forms) did not record page views, partial completions, or unique visitors, participation and completion rates could not be calculated. Analyses were therefore restricted to fully completed questionnaires. Analyses were restricted to fully completed questionnaires. No IP tracking or duplicate-entry prevention mechanisms were implemented.

Experts independently reviewed the e-ΔΔΔΦ tool and evaluated each module according to relevance, clarity, and simplicity using a structured five-point Likert scale, where higher scores indicated stronger agreement. This multidimensional evaluation ensured that the tool was assessed for conceptual accuracy, structural coherence, and practical usability within routine clinical workflows.

Seven experts completed the validation process. Methodological guidance suggests that panels of five to ten experts are sufficient for content validity assessment while maintaining feasibility and statistical reliability (11). Quantitative content validity indices (CVI) were calculated at both the item level (I-CVI) and scale level (S-CVI) to quantify expert agreement. Ratings of 4 or 5 on the five-point Likert scale were considered indicative of item relevance and were used for the calculation of I-CVI values. Qualitative feedback was also collected to inform iterative refinements.When six or more experts are included, an I-CVI threshold of ≥ 0.78 is considered acceptable for demonstrating agreement beyond chance (12,13). The panel size in the present study therefore meets recommended methodological criteria for content validity estimation.

Scale-level validity was evaluated using two complementary indices. The scale-level content validity index based on the average method (S-CVI/Ave) was calculated as the mean of I-CVI values across items, while the scale-level content validity index based on universal agreement (S-CVI/UA) represented the proportion of items achieving complete agreement among experts. An S-CVI/Ave value of ≥ 0.90 was interpreted as indicating strong overall content validity.

In addition to CVI indices, descriptive statistics were calculated to further characterise expert evaluations. For each module and evaluation dimension (relevance, clarity, simplicity), means, standard deviations, and frequency distributions were computed to assess rating consistency and identify potential areas of variability.

Qualitative feedback from open-ended responses was analysed descriptively and organised into thematic categories, including structural refinements, terminology adjustments, interface improvements, and recommendations for additional content. Suggested modifications were reviewed systematically and incorporated where feasible while maintaining conceptual fidelity to the PNDP framework. Where both quantitative ratings and qualitative feedback indicated potential issues, targeted revisions were implemented.

All statistical analyses were conducted using IBM SPSS Statistics (version 27) and Microsoft Excel. The integration of quantitative indices and qualitative feedback strengthened both the methodological robustness and applied relevance of the e-ΔΔΔΦ tool within the Cypriot healthcare context.

Ethical considerations

Ethical approval for this study was obtained from the University of Nicosia Ethics Committee (UREC/2021/15) prior to study commencement. The study was conducted in accordance with the Declaration of Helsinki. Participation was voluntary, and informed consent was obtained electronically through a mandatory consent item at the beginning of each survey. Responses were collected anonymously unless participants voluntarily provided contact details for follow-up communication or acknowledgement of expert contribution. Only data necessary to fulfil the study objectives were collected. All procedures complied with Regulation (EU) 2016/679 (General Data Protection Regulation, GDPR). Data were stored on password-protected institutional cloud systems accessible only to the research team and retained in accordance with institutional data management policies.

Results

3.1 Phase 1 – Exploratory National Needs Assessment

Participants were predominantly early-career professionals, with a median age of 27 years (IQR: 25–30) and a median professional experience of 6 months (IQR: 2–24). The relatively low level of professional experience reflects the inclusion of postgraduate students undertaking supervised clinical placements. Most participants were practicing in Nicosia (n = 27) or Limassol (n = 16). Independent private practice was the most frequently reported practice setting (n = 38; 60.3%), followed by collaborative private practice (n = 10; 15.9%), home visits (n = 7; 11.1%), and institutional settings (n = 6; 9.5%). Most participants provided services in urban areas (n = 50; 79.4%). Two responses from Cypriot professionals practicing outside Cyprus and one respondent not currently practicing were retained to support the limited achieved sample size. Detailed demographic and professional characteristics are presented in Table 1.

Awareness and Use of Documentation Processes

Nearly all participants (98.4%) reported awareness of at least one documentation process (DP). University seminars (68.3%) and clinical placement (58.7%) were the most frequently reported sources of exposure, while CyDNA educational programs were less commonly endorsed (19.0%).

PNDP was the most frequently reported documentation process used in practice (68.3%). SOAP (11.1%) and NCP (6.3%) were less commonly used. A minority (12.7%) reported awareness of documentation processes but no current use.

Knowledge and Extent of Implementation

Among participants aware of a documentation process ($n = 62$), 74.2% self-rated their knowledge as “very good.” Most respondents (72.6%) reported implementing a documentation process for all patients, while 14.5% reported selective implementation and 12.9% reported non-use.

Regarding stage completion, 73.0% reported implementing all stages of the selected documentation process, 17.5% reported partial implementation, and 9.5% reported non-use. Minor discrepancies across related items were treated as data consistency variation rather than substantive differences.

Documentation Process Step Implementation and Perceived Difficulty

Most respondents reported not using SOAP (74.6%) or NCP (76.2%). PNDP non-use was lower. Among PNDP users, step completion rates were high, with strongest endorsement for assessment and diagnosis identification (both >95%). Monitoring and evaluation were the least frequently endorsed step (76.6%). Most participants reported no specific difficult stage. When difficulty was reported, it most commonly concerned the diagnosis and intervention stages, particularly within PNDP and NCP.

Awareness of Recommendations and International Initiatives

Perceptions regarding whether CyDNA had published documentation process recommendations were divided (50.8% “Yes”; 49.2% “No” after collapsing “I don’t know” into “No”). No significant association was observed between age group and this perception ($p = 0.301$; Cramer’s $V = 0.262$). Awareness of EFAD’s or BDA or American Academy of Nutrition and Dietetics international consultation initiative was low (25.4%), with no significant association with age ($p = 0.609$; Cramer’s $V = 0.192$).

Standardised Language Preferences and Implementation Approaches

Half of participants (50.8%) supported the establishment of a standardised method for recording nutrition and dietetic care, while 36.5% indicated partial feasibility across care stages. A small minority questioned usefulness or feasibility. In multiple-response items assessing standardised language (SL) preferences, PNDP was most frequently endorsed (65.1%), followed by NCP (28.6%), SOAP (23.8%), and IDNT (19.0%).

Preferred clinical implementation strategies emphasised ongoing education and integration into electronic health records. In academic settings, inclusion in the formal curriculum was most frequently supported. Estimated implementation timelines ranged from 1.5 to 50 months, with common estimates between 6–12 months.

Participants generally anticipated improvements in professional visibility, auditability, and care quality with SL adoption, although a substantial proportion selected “I don’t know.” Alignment with the Cyprus General Health System (GHS) was the most frequently cited consideration when selecting a standardised language system.

Education Exposure and Improvement Needs

Most participants (68.3%) reported awareness of SL instruction during training. During clinical placement, PNDP was most frequently reported (52.4%), though 22.2% reported no SL use during placement.

Recommendations for improving SL adoption focused primarily on increased education, structured examples, and practical training. Time efficiency and maintenance of current systems were also mentioned.

Nutrition Diagnosis Knowledge and PNDP Challenges

Most participants (61.9%) distinguished medical diagnosis from nutrition diagnosis, while 36.5% selected “Sometimes.” When asked to identify a nutrition diagnosis, responses suggested uncertainty, with 44.4% selecting “none of the above” and 41.3% selecting “weight loss.”

When prompted regarding PNDP components, 81.0% correctly identified all core elements. However, 52.4% reported prior use of PNDP but not current use. Most current or past users did not report difficulty (60.3%), although 27.0% reported challenges. Open-ended responses highlighted time burden and difficulty formulating nutrition diagnoses as the most frequently reported barriers.

Phase 2 and 3 – Expert Content Validation Results (I-CVI, S-CVI, usability)

Expert validation of the electronic PNDP tool (Questionnaire 2)

Seven experts completed the validation questionnaire; demographic data were intentionally not collected. The expert panel comprised clinical dietitians, nutritionists, and academics specifically immunologists, statistician, biochemists, physical education and nutrition experts.

Overall feedback was positive, with suggestions focusing on visual readability (e.g., larger screenshots/fonts), minor wording/terminology refinements, and small content additions (e.g., specific clinical fields and date fields).

Item-Level Content Validity (I-CVI)

The I-CVIs demonstrated strong expert agreement across all evaluation domains (Table 2). For relevance, clarity, and simplicity, I-CVI values ranged from 0.86 to 1.00. All items (100%) exceeded the predefined adequacy threshold of I-CVI $\geq$ 0.78, indicating consistent agreement among panel members.

At the scale level, the S-CVI/Ave was 0.92, reflecting high overall content validity of the eΔΔΔΦ (Table 3). The S-CVI/UA was 0.44, indicating that 44% of items achieved universal agreement among all experts. Given the stringent nature of universal agreement criteria and the size of the expert panel (n = 7), this level of agreement is considered methodologically acceptable.

Descriptive Usability Ratings

Descriptive analysis indicated high usability across evaluation domains. The mean relevance score was 4.71 (SD = 0.45), the mean clarity score was 4.64 (SD = 0.52), and the mean simplicity score was 4.58 (SD = 0.60). The relatively small standard deviations suggest consistent expert ratings across domains (Table 4).

Qualitative Feedback

Qualitative feedback from the expert panel yielded four primary categories: (1) structural refinements, (2) terminology adjustments, (3) interface improvements, and (4) additional content suggestions.

Structural refinements primarily involved minor reordering and grouping of fields within modules to enhance logical workflow alignment. Terminology adjustments focused on improving syntax and grammatical errors. Interface improvements included refinements to field spacing, dropdown presentation, and section labeling to improve navigability. Additional content suggestions involved minor prompts to enhance documentation completeness. All proposed modifications were reviewed systematically and incorporated where appropriate, without altering the conceptual structure of the PNDP framework.

Integration of Quantitative and Qualitative Findings

Items receiving comparatively lower I-CVI values were reviewed in conjunction with corresponding qualitative feedback. Where quantitative ratings were accompanied by comments indicating ambiguity or workflow misalignment, targeted revisions were implemented. For modules demonstrating high quantitative agreement but minor qualitative suggestions, refinements were incorporated selectively to improve clarity while preserving structural integrity. This integrative approach ensured that the final version of the electronic PNDP tool demonstrated both strong statistical content validity and practical usability within the Cypriot clinical context.

Discussion

This study examined national awareness and implementation patterns of documentation processes (DPs) and standardised language (SL) among nutrition and dietetic professionals (NDPs) in Cyprus and subsequently evaluated the content validity and usability of a newly developed e-ΔΔΔΦ. The findings highlight variability in sustained implementation, diagnosis-related challenges, and structural documentation gaps, while expert validation demonstrated strong content validity and high usability of the proposed digital tool.

Although awareness of documentation processes was nearly universal among respondents, implementation patterns were less consistent. PNDP was the most frequently reported framework in practice; however, a substantial proportion of participants indicated discontinuation of use despite prior exposure. This divergence between awareness and sustained implementation suggests that familiarity alone does not ensure routine adoption. Instead, contextual and operational factors appear to influence long-term integration into practice.

Qualitative findings from Phase 1 identified time burden and limited applied training, particularly in diagnostic formulation, as key barriers. These barriers align with the observed difficulties in diagnosis and intervention steps, which were most commonly reported as challenging. Furthermore, responses to the nutrition diagnosis knowledge item revealed uncertainty in identifying appropriate diagnostic statements, despite general conceptual recognition that medical and nutrition diagnoses differ. Collectively, these findings suggest that while the structural logic of PNDP is recognised, applied diagnostic reasoning may remain an area requiring reinforcement.

Interpretation of Documentation Process Adoption in Cyprus

The strong association between DP awareness and university-based exposure underscores the central role of formal education in shaping professional familiarity with structured documentation. PNDP emerged as the dominant framework across both training and reported practice contexts, indicating educational alignment with professional expectations.

However, the transition from academic exposure to sustained clinical implementation appears vulnerable to real-world pressures. The proportion of respondents reporting previous but not current PNDP use suggests that documentation frameworks may be deprioritised when confronted with workload constraints, time limitations, and system-level misalignment. This interpretation is reinforced by participants' emphasis on the need for continuous professional education and integration into electronic records, indicating that structured documentation may be more sustainable when embedded within digital workflows rather than reliant on manual formats.

Observed Difficulties in Implementation

Diagnosis and intervention steps were consistently identified as the most challenging components of structured documentation. These steps require translation of assessment data into precise, problem-oriented statements and targeted intervention plans, representing higher-order clinical reasoning tasks. The comparatively lower endorsement of monitoring and evaluation steps may reflect documentation fatigue or time pressure, rather than conceptual misunderstanding.

The high proportion of respondents selecting "none of the above" in the forced-choice nutrition diagnosis item further indicates uncertainty in applied diagnostic reasoning. This pattern suggests partial conceptual knowledge but reduced confidence in operationalising PAS statements. These findings support the rationale for embedding structured diagnostic scaffolding within electronic tools, as digital prompts may help reduce cognitive load and standardise reasoning pathways.

Implementation Preferences and System-Level Alignment

Participants overwhelmingly supported introducing SL through continuous professional development and curricular integration, reinforcing the importance of structured educational reinforcement. Notably, when asked to prioritise frameworks for adoption, alignment with the Cyprus General Health System (GHS) was the dominant consideration. This finding highlights that successful nationwide standardisation may depend less on conceptual endorsement and more on system-level compatibility and digital infrastructure support.

These results underscore the importance of viewing documentation format not merely as a technical feature but as an implementation determinant. Embedding structured documentation within electronic systems may enhance feasibility, sustainability, and auditability, thereby bridging the gap between theoretical endorsement and routine use.

Expert Validation of the Electronic PNDP Tool

Expert validation demonstrated strong content validity across all modules, with mean I-CVI values ranging from 0.86 to 1.00 and an overall S-CVI/Ave of 0.92. Usability ratings were consistently high across relevance, clarity, and simplicity dimensions, indicating broad professional agreement regarding structural adequacy and practical feasibility.

Qualitative feedback primarily concerned minor structural refinements, terminology adjustments, and interface improvements rather than conceptual redesign. This pattern suggests that the electronic tool was perceived as structurally sound and aligned with PNDP logic, while benefiting from iterative usability optimisation.

Importantly, no module fell below the predefined content validity threshold, supporting the methodological robustness of the development process. The integration of quantitative and qualitative feedback ensured that revisions were both statistically informed and contextually responsive.

Conceptual Contribution: Documentation Format as an Implementation Determinant

Beyond reporting awareness and usability outcomes, this study makes a conceptual contribution by positioning documentation format—manual versus structured electronic—as an independent implementation determinant in dietetic practice. Existing literature has largely examined awareness, attitudes, or barriers related to the PNDP/NCP framework without explicitly conceptualising how the format of documentation itself may influence implementation fidelity, reasoning transparency, and sustainability (11,12).

Findings from Phase 1 demonstrated that awareness alone does not guarantee sustained use. A substantial proportion of participants reported prior PNDP exposure but current non-use, suggesting that contextual and structural barriers may undermine routine application. Time burden and diagnostic uncertainty were recurrent themes, particularly in relation to the formulation of nutrition diagnoses. These findings support the proposition that structured digital scaffolding may reduce cognitive load and enhance adherence to framework logic (9,13).

The electronic PNDP tool developed in this study operationalises documentation format as a structured reasoning pathway rather than a passive recording mechanism. By embedding PES scaffolding, modular data fields, and sequential workflow alignment, the tool transforms the documentation interface into an active implementation support mechanism. In this sense, format becomes not merely a technical feature but a structural facilitator of clinical reasoning consistency (14,15,16).

This reframing contributes to implementation science in dietetics by highlighting the interaction between professional competence, organisational context, and digital infrastructure. It suggests that adoption is not solely dependent on knowledge or attitudes but may be strengthened when structured reasoning is embedded into workflow-compatible electronic systems.

Policy and Practice Implications for Cyprus

The findings have direct implications for professional regulation, educational programming, and digital health policy within Cyprus.

First, the near-universal awareness of documentation processes indicates that foundational exposure exists within academic curricula. However, the variability in sustained implementation and reported diagnostic difficulties suggests that ongoing professional development initiatives may be required to reinforce applied diagnostic reasoning and structured documentation skills beyond graduation.

Second, participants emphasised alignment with the General Health System (GHS) as a primary determinant for adopting standardised language frameworks. This underscores the importance of system-level integration. Embedding structured PNDP templates within national electronic health platforms may enhance feasibility, promote uniform documentation practices, and facilitate quality-of-care monitoring (8). An additional consideration for implementation is interoperability with existing health information systems. Minimising duplicate data entry through integration with electronic health records is essential to reduce documentation burden and potential errors. Future development should prioritise automated data transfer (e.g., anthropometric, medical, and pharmacological data) from existing clinical systems into the PNDP tool to enhance efficiency and user acceptance.

Third, the validated electronic PNDP tool provides an initial prototype that could serve as a foundation for broader digital transformation initiatives in dietetic care. If integrated within national systems, such a tool could support auditability, interprofessional communication, and potential linkage between documentation quality and reimbursement or performance indicators.

Collectively, these findings support the argument that structured digital documentation should be viewed as a policy-level priority rather than solely an individual practitioner responsibility.

Strengths and Limitations

This study employed a sequential multi-phase design integrating a national needs assessment, structured tool development, and formal expert content validation with embedded training components. The integration of quantitative and qualitative data enhanced methodological robustness and enabled triangulation between practitioner experiences and expert consensus. The use of established content validity indices (I-CVI and S-CVI) further strengthens the credibility of the validation process.

Importantly, this study represents the first structured attempt to develop and validate a Greek-language electronic PNDP tool tailored to the Cypriot healthcare context. By grounding tool development in empirical national data, the study ensured contextual responsiveness rather than theoretical transplantation.

Several limitations should be considered when interpreting the findings. The exploratory national needs assessment achieved a modest sample size and was based on convenience sampling, thereby limiting generalisability and introducing potential selection bias. In addition, Phase 1 relied on self-reported practices rather than objective documentation audits, which may have led to overestimation of implementation. The sample was predominantly composed of early-career professionals, which may have influenced reported implementation patterns due to greater exposure to recent academic training but more limited clinical experience. Accordingly, findings should be interpreted as indicative of trends within a specific segment of the workforce rather than representative of the national professional population.

Furthermore, representation of professionals working within the public healthcare system was limited, which may further restrict the applicability of findings across all practice settings.

The expert validation panel, while methodologically adequate in size according to established recommendations, comprised seven purposively selected experts and may not fully capture the diversity of professional perspectives. Although purposive sampling is appropriate for content validation studies, it may introduce selection bias, particularly if participants share similar professional backgrounds or viewpoints. In addition, usability evaluation was limited to expert-based assessment rather than real-world clinical implementation. Future research should therefore evaluate the tool in routine practice settings to assess long-term feasibility, efficiency, and impact on documentation quality.

4.8 Future Perspectives

Future research should extend beyond content validation to examine real-world implementation outcomes. Pilot integration of the e-ΔΔΔΦ within selected clinical settings would allow assessment of documentation completeness, time efficiency, user satisfaction, and patient-related outcomes.

Longitudinal evaluation studies could investigate whether structured electronic scaffolding improves diagnostic accuracy and monitoring consistency over time. Additionally, comparative research across other small health systems could explore scalability and adaptability of the model.

At a systems level, integration with the national electronic health record platform would enable structured data extraction for quality monitoring and outcome benchmarking. This may create opportunities to link documentation quality with performance metrics, further incentivising structured practice.

Ultimately, advancing digital PNDP integration requires collaboration between professional bodies, academic institutions, and health system policymakers to ensure that structured documentation becomes embedded within routine clinical infrastructure rather than remaining an optional practice enhancement.

Conclusion

This study provides empirical and methodological support for the development and validation of a Greek electronic PNDP tool (e-ΔΔΔΦ) tailored to the Cypriot healthcare context. Findings from the national needs assessment highlighted variability in structured documentation practices, diagnostic challenges, and implementation discontinuity despite high awareness of documentation processes. These gaps underscored the need for a structured, workflow-aligned digital solution.

Expert validation demonstrated strong content validity and high usability across evaluation domains. Ratings for relevance, clarity, and simplicity consistently exceeded established adequacy thresholds, indicating that the electronic tool is conceptually aligned with the PNDP framework and operationally feasible for routine clinical use. Suggested refinements were minor and primarily focused on usability enhancements, including visual formatting improvements, minor terminology adjustments, and inclusion of select clinically relevant fields (e.g., current weight and date documentation). No structural redesign was required.

Collectively, the findings suggest that a structured electronic PNDP tool can contribute to greater standardisation of dietetic documentation, improved transparency of clinical reasoning, and enhanced consistency in care delivery. Importantly, the sustainability of implementation is likely to depend on integration within existing digital infrastructures, alignment with the General

Health System (GHS), and provision of targeted training—particularly in nutrition diagnosis formulation.

Abbreviations

NCP – Nutrition Care Process
PNDP – Process for Nutrition and Dietetic Practice
EHR – Electronic Health Record
GHS – General Health System
SL – Standardised Language
PES – Problem, Aetiology, Signs/Symptoms
CVI – Content Validity Index
I-CVI – Item-level Content Validity Index
S-CVI – Scale-level Content Validity Index

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions

EA and EP contributed to conceptualization, methodology, project administration, and writing—review and editing. EP and EA performed the formal analysis. SN and AZ contributed to critical review of the manuscript. EA and EP conducted the validation procedures and were responsible for the development and implementation of the three-phase study design. All authors contributed to the article and approved the submitted version.

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Supplementary Material

NA

12. Figure

Figure 1. Graphical abstract of the study design and development process of the electronic Process for Nutrition and Dietetic Practice tool (e-PNDP).

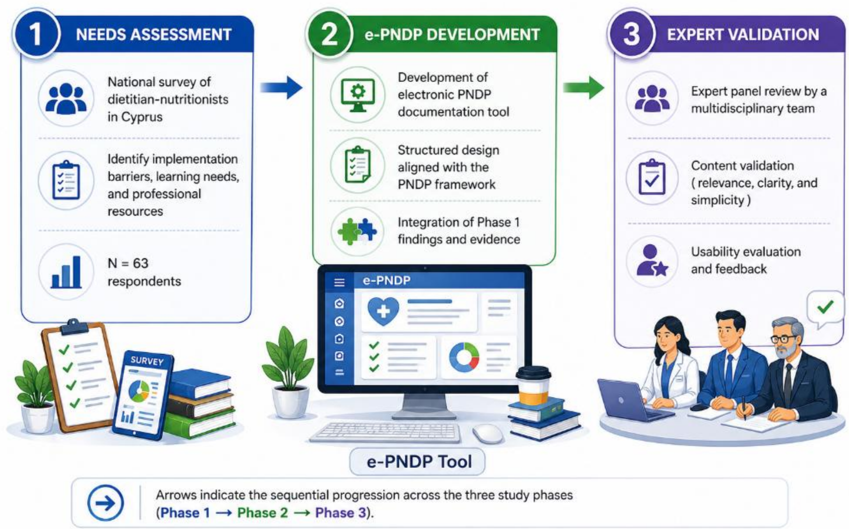

Figure 1. Overview of the three-phase approach used in the development and validation of the electronic Process for Nutrition and Dietetic Practice documentation tool (e-PNDP).

Overview of the three-phase approach used for the development and validation of the electronic Process for Nutrition and Dietetic Practice (e-PNDP) documentation tool. The study comprised: (1) a national needs assessment survey of dietitian-nutritionists in Cyprus (n = 63) to identify implementation barriers and professional needs; (2) development of the electronic PNDP documentation tool informed by these findings and aligned with the PNDP framework; and (3) expert content validation and usability evaluation by a multidisciplinary panel assessing relevance, clarity, and simplicity. Arrows indicate the sequential progression across the study phases.

13 Tables

Table 1. Demographic and professional characteristics of participants (n = 63): median (IQR) version

Characteristic	Value
Age (years), median (IQR)	28.0 (23.5–28.0)
Age group, n (%)	
22–25 years	25 (39.7)
26–30 years	23 (36.5)
31–45 years	12 (19.0)
46–59 years	2 (3.2)
≥60 years	1 (1.6)
City/place of practice, n (%)	
Nicosia	27 (42.9)
Limassol	16 (25.4)
Larnaca	8 (12.7)
Paphos	5 (7.9)
Famagusta	3 (4.8)
Athens	2 (3.2)
UK	1 (1.6)
Not currently practicing	1 (1.6)

Primary practice setting, n (%)	
Private office (independent)	38 (60.3)
Shared practice	12 (19.1)
Home visits	7 (11.1)
Hospital/outpatient clinic	6 (9.5)
Professional experience (months), median (IQR)	15.5 (3.75–60.0)
Professional experience category, n (%)	
1 month	9 (14.3)
2–3 months	7 (11.1)
4–6 months	10 (15.9)
7–24 months	10 (15.9)
25–48 months	4 (6.3)
>2 years	23 (36.5)

Note: Values are presented as n (%) unless otherwise indicated. Median and interquartile range (IQR) values for age and professional experience were estimated from grouped survey categories using category midpoints. Percentages are based on the total sample (N = 63). Locations outside Cyprus represent Cypriot dietitians practicing abroad.

Table 2. Scale-level content validity of the electronic PNDP tool (e-ΔΔΔΦ).

Domain	S-CVI/Ave	S-CVI/UA	Min I-CVI	Max I-CVI
Relevance	0.92	0.44	0.86	1

Clarity	0.94	0.56	0.86	1
Simplicity	0.90	0.33	0.86	1
Average across the 3 domains	0.92	0.44	0.86	1

Note: I-CVI = item-level content validity index; S-CVI/Ave = scale-level content validity index calculated using the average method; S-CVI/UA = scale-level content validity index calculated using the universal agreement method. An I-CVI threshold of ≥0.78 was considered acceptable for expert panels comprising six or more experts.

Table 3. Item-level content validity of the electronic PNDP tool (e-ΔΔΔΦ).

Module	I-CVI/Ave
Front Page	0.86
Anthropometry Assessment	0.90
Biochemistry Assessment	0.90
Medical History	0.86
Medication	0.90
Nutrition and Dietetics Diagnosis	0.95
Summary of Assessment	1.00
Print or Save	1.00
Print or Save (Continued)	0.95

Note: I-CVI/Ave = average item-level content validity index across expert ratings.

Table 4. Usability ratings of the electronic PNDP tool.

Evaluation Dimension	Mean	SD
Relevance	4.71	0.45
Clarity	4.64	0.52

Simplicity	4.58	0.60

Note: Values represent mean scores and standard deviations (SD) based on expert evaluations using a five-point Likert scale, where higher scores indicate greater agreement regarding relevance, clarity, and simplicity of the tool.

Appendix XII: Graphical Abstract of thesis manuscript.

The study followed a three-phase approach: (1) a national needs assessment survey of dietitian-nutritionists in Cyprus (n = 63) to identify implementation barriers and professional needs; (2) development of the electronic PNDP documentation tool based on these findings and aligned with the

PNDP framework; and (3) expert content validation and usability evaluation by a multidisciplinary panel to assess relevance, clarity, and simplicity.