Nutrition Care Process and Model Update: Toward Realizing People-Centered Care and Outcomes Management

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THE NUTRITION CARE PROCESS (NCP) is a systematic method that nutrition and dietetics practitioners use to provide nutrition care.[1] In this article, nutrition and dietetics practitioners or professionals; dietitians; dietitians-nutritionists; and dietetic technicians, registered, are collectively referred to as professionals. The Nutrition Care Process Model (NCPM) describes the NCP by presenting the workflow of professionals in diverse individual and population care delivery settings. Implementation of the NCPM has been associated with several advantages, including use of a common framework for nutrition care and research, promotion of critical thinking, more-focused nutrition care documentation, increased acknowledgement of the value of nutrition care by other health care professionals, and improved application of evidence-based guidelines.[2-5] Potential target audiences for the NCPM include practitioners, educators and students, professional credentialing agencies, health system accrediting agencies, health care funding organizations, payers, and clients.

The Academy of Nutrition and Dietetics (Academy) adopted the NCP and NCPM for use in the United States in 2003.[1] Since then, international dietetics associations have supported adoption of the NCPM.[6] The development history of the NCPM is described in detail by Hammond and colleagues.[7]

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The NCPM is updated approximately every 5 years, which aligns with other Academy resources such as Evidence-Based Nutrition Practice Guidelines.[8] This ensures that the NCPM reflects current practice.

This article presents an expert consensus update review of the NCPM completed during the year 2013-2014 by the Nutrition Care Process and Terminology (NCPT) Committee (which became the Nutrition Care Process Research Outcomes Committee in 2015) and its international workgroup. Twenty-four experts from around the world participated in a consensus-building process for each component of the NCPM. They considered comments submitted to the NCP website, feedback from translators and users, as well as international information on health quality goals. The current NCPM update highlights three themes that emerged as a result of the consensus process: use of concise language in the NCPM, promotion of professionals' responsibility for outcomes management, and support for people-centered care (PCC).[9] Finally, experts recommend associated actions to advance the NCPM as the Academy embarks into its second century initiatives toward a world where all people thrive through the transformative power of food and nutrition. International input was an important influence for improvement of the current revision. The information in this article replaces previous information describing the NCPM.

BACKGROUND

The NCP is a roadmap and consists of four separate yet interconnected steps: Nutrition Assessment and Reassessment, Nutrition Diagnosis, Nutrition Intervention, and Nutrition Monitoring and Evaluation (Figure 1). The four steps are divided into two components: problem identification and problem solving. This distinction is important for application purposes. Problem identification includes Nutrition Assessment and Reassessment (Step 1), and Nutrition Diagnosis (Step 2). Problem solving includes Nutrition Intervention (Step 3), and Nutrition Monitoring and Evaluation (Step 4). It has been helpful for new adopters to implement the NCP in two consecutive phases where Phase 1 involves implementation of problem identification, and Phase 2 involves the addition of problem solving. Each step is important to complete before advancing to the next step. In practice, as new information becomes available, professionals revisit previous steps of the NCP to reassess, update nutrition diagnoses, adapt interventions, and/or modify goals and monitor outcomes. The NCPM (Figure 2) is depicted unidirectionally where one progresses from Nutrition Assessment and Reassessment to Nutrition Diagnosis, and so on; yet, in practice, the model is dynamic and multidirectional to support critical thinking and timely care. This is important in follow-up care of clients. As new information is collected, a professional may revisit previous steps of the process to remove, add, or change nutrition diagnoses, adjust interventions, or modify goals and monitoring data. Monitoring and evaluation data from the prior client interaction (or visit) is data that begins the reassessment of the subsequent interaction. Hence, the model carries over care from one interaction to the next.

The NCPM incorporates scientific evidence and aims to move professionals from experience-based to

Step 1: Nutrition Assessment and Reassessment	
Definition and purpose	Nutrition Assessment is a systematic approach to collect, classify, and synthesize important and relevant data from clients (where "client" refers to individual and population). This step also includes Reassessment, which additionally includes collection of new data, and comparing and re-evaluating data from the previous interaction to the next. Nutrition Assessment is an ongoing, dynamic process that involves initial data collection as well as continual reassessment and analysis of the client's status compared with accepted standards, recommendations, and/or goals
Data sources/tools for assessment	• Screening or referral form • Client interview • Medical or health records • Consultation with other caregivers, including family members • Community-based surveys and focus groups • Statistical reports, administrative data, and epidemiologic studies
Types of data collected	• Food- and nutrition-related history • Anthropometric measurements • Biochemical data, medical tests, and procedures • Nutrition-focused physical examination findings • Client history
Nutrition assessment components	• Review data collected for factors that affect nutrition and health status • Cluster individual data to identify at least 1 nutrition diagnosis as described in diagnosis reference sheets • Identify accepted standards, recommendations, and/or goals by which data will be compared
Reassessment components	• Collect new data • Compare data with previous interaction/s: • Compare the monitoring and evaluation outcomes/indicators documented in the previous interaction to new data • Evaluate if the client's nutritional status has changed to demonstrate effectiveness of intervention • Evaluate the status of the Nutrition Diagnosis • Evaluate whether the nutrition assessment data from the previous interaction need to be reassessed or changed depending on the client's status or situation • Identify new nutrition assessment data to monitor and evaluate during the next interaction
Critical thinking	• Determining important and relevant data to collect • Determining the need for additional information • Selecting assessment tools and procedures that match the situation • Applying assessment tools in valid and reliable ways • Validating the data
Determination for continuation of care	If upon completion of an initial Nutrition Assessment or Reassessment, it is determined that the problem cannot be modified by further nutrition care, discharge, or discontinuation from this episode of nutrition care may be appropriate
Step 2. Nutrition Diagnosis	
Definition and purpose	Nutrition Diagnosis is a nutrition and dietetics professional's identification and labeling of an existing nutrition problem that the nutrition and dietetics professional is responsible for treating
Data sources/tools for diagnosis	Organized assessment data that is clustered for comparison with defining characteristics of suspected diagnoses as listed in diagnosis reference sheets

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Figure 1. The 4 Steps of the Nutrition Care Process Model with distinguishing characteristics.

Nutrition Diagnosis components	The Nutrition Diagnosis is expressed using nutrition diagnostic terms and the etiologies, signs, and symptoms that have been identified in the reference sheets describing each diagnosis. There are three distinct parts to a nutrition diagnostic statement: 1. The Nutrition Diagnosis describes alterations in a client's status 2. Etiology is a factor gathered during the Nutrition Assessment that contributes to the existence or the maintenance of pathophysiological, psychosocial, situational, developmental, cultural, and/or environmental problems • The etiology is preceded by the words "related to" • Identifying the etiology will lead to the selection of a nutrition intervention aimed at resolving the underlying cause of the nutrition problem whenever possible 3. Signs/symptoms (defining characteristics) The defining characteristics are a cluster of signs and symptoms that provide evidence that a Nutrition Diagnosis exists • The signs and symptoms are preceded by the words "as evidenced by" • Signs are the observations of a trained professional • Symptoms are changes reported by the client
Nutrition diagnostic statement	A well-written nutrition diagnostic statement should be: • Clear and concise; • Specific to a client; • Limited to a single client problem; • Accurately related to 1 etiology; and • Based on signs and symptoms from the assessment data
Critical thinking	• Finding patterns and relationships among the data and possible causes • Making inferences • Stating the problem clearly and singularly • Ruling in/ruling out specific diagnoses • Identifying an etiology that may be resolved, lessened, or managed by the Intervention/s • Identifying signs and symptoms that are measurable or their change may be tracked • Prioritizing identified problems
Determination for continuation of care	Because the Nutrition Diagnosis names and describes the problem, the determination for problem solving follows the Nutrition Diagnosis step. If a professional does not identify a Nutrition Diagnosis or the potential exists for a Nutrition Diagnosis to develop, a professional may determine an appropriate method and interval for continuation of care
Step 3. Nutrition Intervention	
Definition and purpose	A Nutrition Intervention is a purposefully planned action(s) designed with the intent of changing a nutrition-related behavior, risk factor, environmental condition, or aspect of health status. Nutrition Intervention consists of two interrelated components: planning and intervention. The Nutrition Intervention is typically directed toward resolving the nutrition diagnosis or the nutrition etiology Less often, it is directed at relieving signs and symptoms
Data sources/tools for Interventions	• The Academy of Nutrition and Dietetics' Evidence-Based Nutrition Practice guidelines or other evidence-based guidelines from professional organizations • The Academy of Nutrition and Dietetics' Evidence Analysis Library and other evidence such as the Cochrane Library • Current research literature • Results of outcome management studies or quality improvement projects

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Figure 1. *(continued)* The 4 Steps of the Nutrition Care Process Model with distinguishing characteristics.

Nutrition Intervention components	1. Planning • Prioritize interventions based on urgency, influence, and available resources • Write a nutrition prescription based on a client's individualized recommended dietary intake of energy and/or selected foods or nutrients based on current reference standards and dietary guidelines and a client's health condition and nutrition diagnosis • Collaborate with the client to identify goals of the intervention for each diagnosis • Select specific intervention strategies that are focused on the etiology of the problem and that are known to be effective based on best current knowledge and evidence • Define time and frequency or care, including intensity, duration, and follow-up 2. Implementation • Collaborate with the client to carry out the plan of care • Communicate the plan of nutrition care • Modify the plan of care as needed • Follow-up and verify that the plan is being implemented • Revise strategies based on changes in condition or response to intervention
Critical thinking	• Setting goals and prioritizing • Defining the nutrition prescription or basic plan • Making interdisciplinary connections • Matching intervention strategies with client needs, nutrition diagnoses, and values • Choosing from among alternatives to determine a course of action • Specifying the time and frequency of care
Determination for continuation of care	If a client has met intervention goals or is not at this time able/ready to make needed changes, the professional may discharge the client from this episode of care as part of the planned intervention
Step 4. Nutrition Monitoring and Evaluation	
Definition and purpose	During the first interaction, appropriate outcomes/indicators are selected to be monitored and evaluated at the next interaction. During subsequent interactions, these outcomes/indicators are used to demonstrate the amount of progress made and whether goals or expected outcomes are being met. Nutrition monitoring and evaluation identifies outcomes/indicators relevant to the nutrition diagnosis and intervention plans and goals
Data sources/tools for Nutrition Monitoring and Evaluation	Self-monitoring data or data from other records including forms, spreadsheets, and computer programs Anthropometric measurements, biochemical data, medical tests, and procedures Client surveys, pretests, posttests, and/or questionnaires Mail, telephone, and electronic media follow-up, such as e-mail
Types of outcomes measured	• Nutrition-related history • Anthropometric measurements • Biochemical data, medical tests, and procedures • Nutrition-focused physical findings • Knowledge gained • Behavior change
Nutrition Monitoring and Evaluation components	• In the first interaction: Select appropriate outcomes/indicators • In subsequent interactions This step includes three distinct and interrelated processes 1. Monitor progress • Check client understanding and adherence with plan; • Determine whether the intervention is being implemented as prescribed;

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Figure 1. *(continued)* The 4 Steps of the Nutrition Care Process Model with distinguishing characteristics.

	• Provide evidence that the plan/intervention strategy is or is not changing client behavior or status; • Identify other positive or negative outcomes; • Gather information indicating reasons for lack of progress; and • Support conclusions with evidence 2. Measure outcomes/indicators • Gather data for outcomes/indicators that are relevant to the nutrition diagnosis or signs or symptoms, nutrition goals, medical diagnosis, outcomes, and quality management goals 3. Evaluate outcomes/indicators • Compare current findings with previous status, intervention goals, and reference standards
Critical thinking	Selecting appropriate outcomes/indicators • Using appropriate reference standard for comparison • Defining where client is in terms of expected outcomes • Explaining variance from expected outcomes • Determining factors that help or hinder progress • Deciding between discharge or continued care
Determination for continuation of care	Based on the findings, the professional may actively continue care; or if nutrition care is complete or no further change is expected, discharge the client. If nutrition care continues, reassessment may result in refinements to the diagnosis and intervention. If care does not continue, a client may still be monitored for a change in status and re-enter nutrition care at a later date

Figure 1. *(continued)* The 4 Steps of the Nutrition Care Process Model with distinguishing characteristics.

evidence-based practice. The NCPM strives to provide quality, consistent practice and to achieve expected outcomes at all levels of career development. If the NCPM is applied consistently, quality of care and improved health outcomes should enhance recognition for professionals on multidisciplinary teams. Current research demonstrates that it is possible to measure application of the NCPM and demonstrate efficacy of the NCPM in practice.[5]

NCPM

Core

The focus of the NCPM is a central Core that embraces the many and varied areas in which nutrition and dietetic care is practiced. Consequently, professional interactions that influence individuals and populations are recognized and incorporated into the model. Populations refers to demographically defined groups or otherwise identifiable groups. Individuals and populations are referred to as clients throughout this article and client also includes supportive individuals (eg, family and caregivers) and structures (eg, social service agencies and faith-based organizations). In the Core, the word *interacts* describes the dynamic relationship between a professional and a client in which PCC and client engagement contribute to treatment decisions, intervention strategies,[10] or environment changes. Interacts is a broader and more inclusive word than relationship, which was used in the previous NCPM.[11] Interacting encompasses the care of populations and groups as well as individuals. For example, a population survey is an interaction not a relationship. An interview is an interaction between a client and a professional through which a relationship can develop. Also, an in-person or remote visit with client(s) is an interaction.

Nutrition Assessment and Reassessment: Step 1

Nutrition Assessment and Reassessment is a systematic approach for collecting, classifying, and synthesizing data to describe nutritional status, related nutrition problems, and their causes. Nutrition Assessment is initiated from nutrition screening or client referral. Nutrition Assessment is a continuous process requiring initial data collection with continued reassessment and analysis of a client's data compared with accepted standards, recommendations, and/or goals like growth charts, dietary guidelines, and/or individual needs. Although professionals are familiar with performing a Nutrition Assessment, the systematic approach of Nutrition Assessment and Reassessment coupled with standardized terminology facilitates organized documentation, encourages critical thinking, and supports communication, collaboration, and quality care for clients with nutrition-related problems.[4]

In this update, Nutrition Assessment and Reassessment is clarified further to describe specifically what a professional is expected to do (Figure 3). A critically thoughtful professional acquires, analyzes, and interprets the important and relevant data contributing to the potential nutrition-related problem or problems. Critical thinking tasks may vary with level of practice (Figure 4).[12]

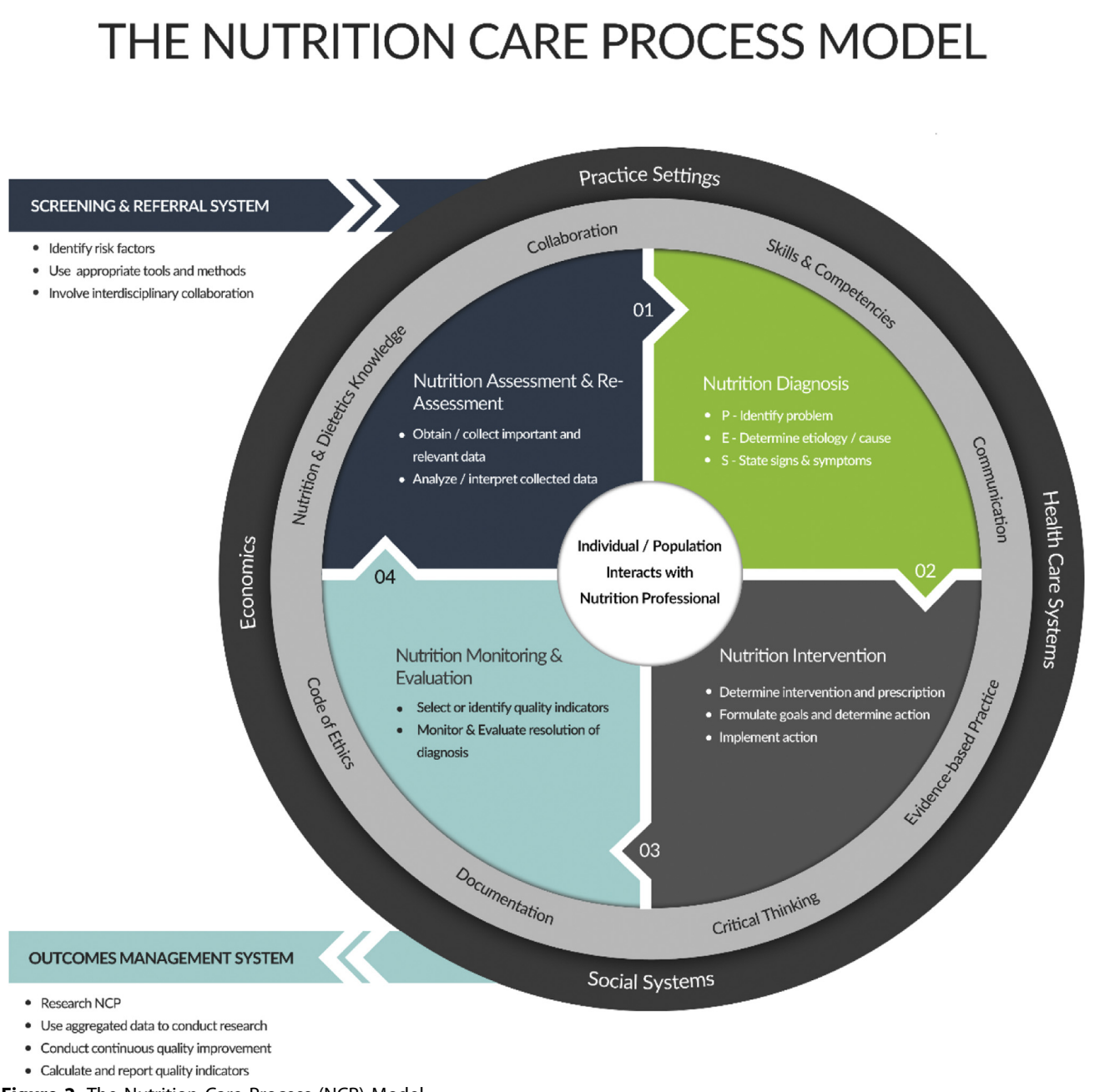

Figure 2. The Nutrition Care Process (NCP) Model.

The data collected and analyzed during this step direct professionals in the selection of a Nutrition Diagnosis. New information that is collected during follow-up interactions (ie, interactions that occur after the initial one), and comparison of data between interactions provide the basis for Reassessment, and the possibility for changed or resolved Nutrition Diagnoses. As the nutrition intervention unfolds during follow-up interactions, the relevant Monitoring and Evaluation data of the previous interaction(s) inform Reassessment and the possibility for changed nutrition diagnoses. Thus, in a follow-up interaction, the Reassessment begins where Monitoring and Evaluation ended during the previous interaction. It should be highlighted that Reassessment is not only comparing results from one interaction to the next to establish change/progress between interactions. Reassessment is also an opportunity to collect new important and relevant information to develop or modify a Nutrition Diagnosis that best fits the present situation of a client.

Nutrition Diagnosis: Step 2

From Nutrition Assessment data, a professional is able to determine whether there is a nutrition problem and label it as a Nutrition Diagnosis. Nutrition Diagnosis identifies and describes a specific problem or problems that can be resolved or improved

through Nutrition Intervention. A Nutrition Diagnosis (eg, inconsistent carbohydrate intake)[13] is different from a medical diagnosis (eg, diabetes mellitus). As the client responds to Nutrition Intervention, the Nutrition Diagnosis can improve or resolve. Critical thinking is needed to prioritize nutrition diagnoses for Nutrition Intervention. As shown in Figure 4, a variety of critical thinking tasks are important to develop the Nutrition Diagnosis. For example, stating the problem clearly and singularly is expected to be carried out efficiently by a novice professional. Other skills, such as finding patterns, may be conquered with greater experience. It is possible and desirable that professionals of all career stages are able to carry out necessary critical thinking tasks.[14]

The Nutrition Diagnosis is communicated as an identify problem, determine etiology/cause, and state signs and symptoms (PES) statement. This PES statement is written with linking words (ie, problem "related to" etiology "as evidenced by" signs and symptoms). The NCPT, which is discussed more later in this article, provides a standardized nutrition diagnostic terminology that defines nutrition problems.[13] It is important to review the specific Nutrition Diagnosis definition to confirm that this is the most appropriate Nutrition Diagnosis for the situation. It is as important to review the reference sheet of the Nutrition Diagnosis from the NCPT to verify that at least one indicator described in the respective reference sheet is present in the client's assessment data. Next, a professional determines the etiology or root cause of the nutrition problem. The selection of interventions that address the etiology are more likely to provide desired nutrition care outcomes. To finalize the PES statement, a professional selects signs and symptoms that can demonstrate resolution or improvement in the nutritional diagnosis as a result of Nutrition Interventions.

Nutrition Intervention: Step 3

When possible, Nutrition Intervention is collaborative between a professional and a client. The professional plans the Nutrition Intervention after prioritizing Nutrition Diagnoses by critically considering the severity of the nutrition problem and the client's values and safety (Figure 4). Nutrition intervention has two related planning phases. In the first phase, the professional and client jointly determine achievable and measurable goals. These goals are important to define the time frame during which the nutrition problem is to be resolved, provide direction to the plan, select and implement interventions intended to achieve the goals, provide criteria to measure results of intervention during Nutrition Monitoring and Evaluation, and evaluate effectiveness of intervention and revise when indicated. The next phase is to determine the nutrition prescription and interventions that will meet the agreed upon goals. The specified activity to determine a nutrition prescription, a client's recommended dietary intake based on current reference standards and dietary guidelines,[13] is new to the current revision of NCPM (Figure 3).

Interventions are a planned set of specific behaviors or actions performed, delegated, coordinated, or recommended by a professional that move a client toward a desired outcome. The chosen interventions intend to alter or eliminate the etiology to resolve the Nutrition Diagnosis. With goals agreed upon, prescription and interventions selected, action is undertaken to implement Nutrition Intervention before proceeding to Monitoring and Evaluation.

Nutrition Monitoring and Evaluation: Step 4

During Nutrition Monitoring and Evaluation, a professional examines the timely results following implementation of Nutrition Interventions. For this update, wording was clarified to incorporate key Nutrition Monitoring and Evaluation practice actions (Figures 2 and 3). These actions include selecting quality indicators derived from best practices and evidence-based guidelines. Indicators use readily available data to provide a quantitative measure for health professionals, organizations, and planners aiming to achieve improvement in the care and the processes by which client care is delivered.[15]

A professional monitors and evaluates the progress or resolution of the Nutrition Diagnosis and determines whether Reassessment is necessary. Standardized terms to assess the extent of Nutrition Diagnosis resolution have not been developed. But, as an example, the Academy of Nutrition and Dietetics Health Informatics Infrastructure (ANDHII) currently uses the following descriptors for resolution: resolved, continued, and removed (for more information on ANDHII, see the dedicated section in this article). A Nutrition Diagnosis can be monitored and evaluated at the end of a single visit. For example, learning assessment may be evaluated at the conclusion of a nutrition education session.

Framing Rings

Two framing rings (outer and middle) contextualize the four steps of the NCP (inner ring), and the Core (Figure 2). The outer ring represents the social context of nutrition care. There are no changes in the terms used to define the outer ring. However, the scope of these terms is broader. As defined in 2008, the outer ring represented the influences on how people received nutrition information.[11] In the updated NCPM, this ring also represents how professionals engage their clients. Examples of client engagement in the outer ring include advocating public policy within social systems or using a client portal within a health care system's electronic health record for chronic care management.

The middle ring represents the required qualities and attributes that differentiate the nutrition and dietetics professionals from other professions.[11] This is to emphasize that the nutrition and dietetics professionals contribute the critical thinking, code of ethics, and evidence-based practice that are unique to nutrition and dietetics science and practice. A significant change within the middle ring was placing the word *documentation* in this ring after removing the word *document* from each step of the NCP. The expectation to document the NCP remains. Although one may argue that *communication*, also included in this ring, implies the act of documentation, in some countries communication might be limited to verbal means and documentation may not be required or might not be an allowed privilege for nutrition and dietetics professionals. The explicit inclusion of the concept of

Function	The NCP Model	The NCP Model
Review year	2008	2015
Standardized language	• International Dietetics and Nutrition Terminology • Print format (book) • Second edition (purple cover) • Third edition (green cover) • Fourth edition (yellow cover)	• Electronic • NCP Terminology • Electronic format (web-based)
Nutrition Assessment and Reassessment step (inner ring)	• Obtain/collect timely and appropriate data • Analyze/interpret with evidence-based standards • Document	• Obtain/collect important and relevant data • Analyze/interpret collected data
Nutrition Diagnosis step (inner ring)	• Identify and label problem • Determine cause/contributing risk factors • Cluster signs and symptoms/defining characteristics • Document	• Identify problem • Determine etiology/cause • State signs and symptoms
Nutrition Intervention step (inner ring)	• Plan nutrition intervention (set goals and determine a plan of action) • Implement nutrition intervention (care is delivered and actions are carried out) • Document	• Determine intervention and prescription • Formulate goals and determine action • Implement action
Nutrition Monitoring and Evaluation step (inner ring)	• Monitor progress • Measure outcome indicators • Evaluate outcomes • Document	• Select or identify quality indicators • Monitor and evaluate resolution of diagnosis
Outcomes management system	• Monitor the success of the NCP implementation • Evaluate influence with aggregate data • Identify and evaluate causes of less-than-optimal performance and outcomes • Refine use of NCP	• Research NCP • Use aggregated data to conduct research • Conduct continuous quality improvement • Calculate and report quality indicators
Center circle (core)	• Relationship between patient/client/group and nutrition and dietetics practitioner	• Individual/population interacts with nutrition and dietetics practitioner
Middle ring	• Dietetics knowledge • Skills and competencies • Critical thinking • Collaboration • Communication • Evidence-based practice • Code of ethics	• Dietetics knowledge • Skills and competencies • Critical thinking • Collaboration • Communication • Evidence-based practice • Code of ethics • Documentation
Outer ring	• Practice settings • Health care systems • Social systems • Economics	• Practice settings • Health care systems • Social systems • Economics

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Figure 3. Comparison of functions in the Nutrition Care Process (NCP) Model.

Function	The NCP Model	The NCP Model
Screening and referral system	• Identify risk factors • Use appropriate tools and methods • Improve interdisciplinary collaboration	• Identify risk factors • Use appropriate tools and methods • Improve interdisciplinary collaboration

Figure 3. *(continued)* Comparison of functions in the Nutrition Care Process (NCP) Model.

documentation in a framing ring was deemed appropriate and necessary to underline that documentation is a requirement for professionals adopting the NCPT internationally. This was important given the range of practices or requirements internationally that vary from documentation in the health record which is a legal requirement in some countries to no written documentation by dietitians because of different levels of privileges. Documentation is a desirable source of data for monitoring and evaluating care and supporting the Outcomes Management System.

The role and placement of nutrition informatics in the framing rings was considered. The consensus was that informatics provides useful tools for all parts of the NCPM and its supporting structures and did not need designation within the NCPM. Informatics tools may not be available to all professionals and professionals depend upon the outer ring for their availability.

SUPPORTING STRUCTURES

Screening and Referral System

The Screening and Referral System is external to the rings of the NCP because it may be carried out by collaborators outside the nutrition and dietetics profession. This supporting system is often developed and managed by professionals. The purpose of this system is to identify and refer those individuals and populations who already have or are at risk for nutrition-related problems, who are appropriate for nutrition care services, and who would benefit from participation in the NCP. The nutrition screening process applies appropriate, valid, and reliable screening tools and resources to identify and recognize nutritional risk factors.

Outcomes Management System

The Outcomes Management System is a supporting structure outside the NCP because it can be operated by members of various professions. As with Nutrition Screening and Referral, the Outcomes Management System intends to be collaborative with leadership from professionals. In 2008, the Outcomes

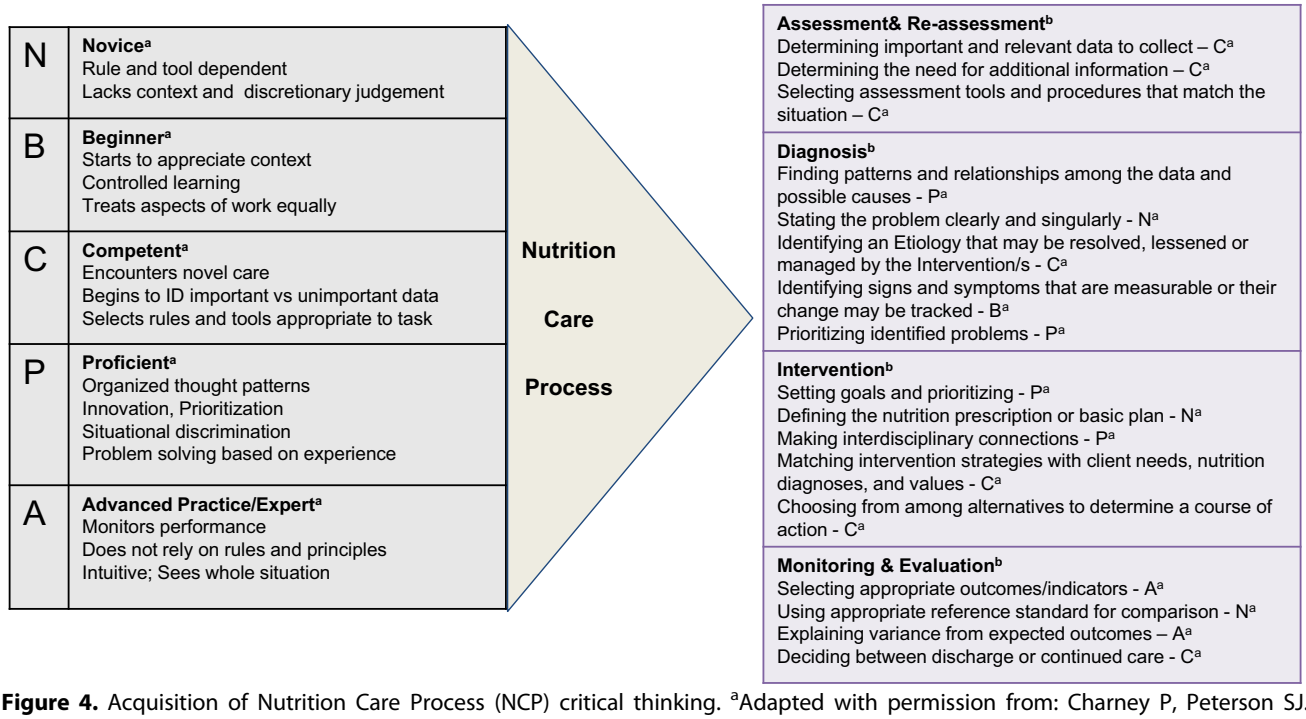

Figure 4. Acquisition of Nutrition Care Process (NCP) critical thinking. [a]Adapted with permission from: Charney P, Peterson SJ. Critical thinking skills in nutrition assessment and diagnosis. http://www.eatrightpro.org/resource/practice/position-and-practice-papers/practice-papers/practice-paper-critical-thinking-skills-in-nutrition-assessment. Published November 2013. Accessed February 16, 2017.12. [b]For each NCP step, the stated critical thinking task is labeled with the career development stage by which one should feel confident performing the task. ID=identification.

Management System emphasized improving and strengthening the NCPM within the profession through the following four actions: monitor the success of the NCP implementation, evaluate the influence [of the NCP] with aggregate data, identify and analyze causes of less than optimal [NCP] performance and outcomes, and refine the use of the NCP. These outcomes management actions continue and are combined in the updated model as Research NCP (Figure 2 and Figure 3).

The updated NCPM challenges professionals to demonstrate the improved nutritional health of clients through participation in research and quality improvement activities. Aggregated data continue to be the foundation of NCP research. Infrastructure to aggregate and manage data from the NCP did not exist in 2008. An example of this new infrastructure is the ANDHII.[16] ANDHII makes possible the new activity, "Use aggregated data to conduct research." This wording places Outcomes Management in the center of research priorities, which is necessary to drive improvements at the organization and health systems levels.[17] The implication is that all professionals when using the NCP become research participants as data contributors. Outcomes Management is no longer a function reserved for those knowledgeable in research design, data processing, and statistical analysis; rather, it becomes an integral, collaborative activity for all professionals.

Outcomes research not only includes NCP research to benefit professional development and practice, but also aims to show the beneficial effect of the NCP on the health of clients.[5] To this end, two new activities are incorporated into the Outcomes Management System of this updated NCPM. First, "Conduct continuous quality improvement" applies to improving the model and care delivery as professionals participate in a learning organization. The second activity, "Calculate and report quality indicators," supports the Academy's engagement to promote the reporting of malnutrition quality measures within the US health care system, (http://www.eatrightpro.org/resource/practice/quality-management/quality-improvement/malnutrition-quality-improvement-initiative), and the reporting of quality indicators pursued by other national health systems. These activities support professionals' ability to report quality measures and other results from the Outcomes Management System to the framing rings. The Outcomes Management System is linked to the selection of quality indicators during Nutrition Monitoring and Evaluation. Through the fully deployed Outcomes Management System, professionals influence the NCP environment defined by the framing rings.

NCPT

A terminology that describes the NCP is necessary to document the delivery and study of nutrition care. Creation of the NCPT is a contemporaneous endeavor with the development of the NCP. Terminology work began in 2003,[18] and a terminology to support the NCP was published as a printed manual in 2009: *International Dietetics and Nutrition Terminology Reference Manual: Standard Language for the Nutrition Care Process*.[19] In 2014, International Dietetics and Nutrition Terminology was converted to an electronic database, called the eNCPT, as the management of an expanding terminology (Figure 3) exceeded the capabilities of a printed manual. eNCPT is currently translated from US English into Swedish, German (Swiss), French (Canadian), Norwegian, and Danish. At the time of this writing, Chinese (Simplified), Chinese (Mandarin), Portuguese (Brazilian), and Spanish (Mexican) translations are in progress.

NCPT can be used to document nutrition care in any medium, but it is fundamental when documenting in an electronic health record. In 2011, work began to map and model the NCPT into international medical terminology standards. Mapping and modeling are essential for NCPT to be included in the document architecture for certified US electronic health records. These terminologies have also been adopted in other countries. Mapping and modeling are continuous processes because new terms are regularly being added to the NCPT. Recent additions include terms describing findings of the Nutrition Focused Physical Examination, terms resulting from moving Malnutrition Disorders into the clinical domain of Nutrition Diagnosis, a collection of terms focused on public health, and alternative synonyms for some behavior-related terms considered harsh by the international community. Documentation of the NCP using the NCPT creates data. The need to systematically collect these data and research the NCP led to the design of ANDHII, a web-based data registry.

ANDHII

ANDHII is a data aggregation platform designed to collect data generated by the application of the NCP. The platform has three functions: Smart Visits that enable data entry; Dietetics Outcomes Registry that generates reports using the aggregated data and support comparative effectiveness studies; and Nutrition Research Informatics, which facilitates data collection and management for quality improvement and research projects. The structure of ANDHII is the NCP with data being derived from NCPT.

Data aggregation schemes abound in health care. Data are routinely submitted to health information exchanges, accreditation agencies, payers, and government departments and ministries. Examples include metrics required by The Joint Commission concerning patient safety or information about 30-day readmissions requested by the Centers for Medicare and Medicaid Services.

As with any electronic platform, the Academy continuously works to improve ANDHII's usability and functionality to meet technologic, legislative, and international needs. There is potential for international use of ANDHII, although associated costs, translation, and varying research ethics regulations will need to be addressed. ANDHII has been used to explore the feasibility of validating malnutrition diagnostic criteria by aggregating data from the United States and Australia.[20] ANDHII has also been used to investigate the influence of evidence-based nutrition practice guidelines for the prevention of diabetes on both practice patterns and patient outcomes.[5,21,22]

These studies have demonstrated the potential of incorporating tools such as ANDHII into practice. With the availability of ANDHII, the Outcomes Management System can be integrated into practice much like the process of learning to write a Nutrition Diagnosis.

LOOKING AHEAD

This article describes the current NCPM update and compares and contrasts it with the 2008 version of the model.[11] Themes that emerged were concise language to promote translation, dissemination and adoption of NCP, promotion of professional-driven outcomes management with the emergence of smartphone applications and web-based data aggregation tools, and embracing PCC.[9] Further, the article describes how the NCPM is supported by its standardized terminology, NCPT, and outlines ongoing integration of NCPM/NCPT into an innovative outcomes management platform.[16]

The NCP and NCPM will continue to undergo evaluation and updating. The supporting NCPT will require refinement to sustain the reporting of quality measures and outcomes. Over the 14 years of the NCPM's adoption, the NCP community has been growing and actively contributes to the global uptake, improvement, and research of the NCP.[4-6,23-30] The NCPM has evolved with practice from a professional-defined care delivery system to a PCC interaction. The NCPM progresses from learning to write nutrition diagnoses to routinely entering outcomes of care using a data aggregation tool. The NCP is evolving to become the international standard for nutrition and dietetics care delivery. To foster this maturation, three areas of focus are recommended:

Creation of New Knowledge

- Support NCP-related research;
- use aggregated data to study all steps of the NCP in a variety of populations, practice cultures, and stages of professionals' career development;
- validate expected plans of care that link nutrition diagnoses with specific interventions to demonstrate effectiveness;
- investigate whether the NCP improves outcomes compared with not using the NCP;
- define appropriate nutrition and dietetics outcomes; and
- enhance and develop electronic, digital standards, and structures that accept NCP data.

Globalization of the NCP

- Promote adoption of the NCP and translations of the NCPT;
- support the NCP in diverse practice cultures;
- determine economic value of dietitian/nutritionist interventions with clients; and
- continue international collaborations.

Continuous Training Focused on Practice Area and Professional's Career Development Stage

- Adopt NCPM to all stages of career development, novice through expert;
- use NCPM as a framework for all practice areas, including public health, health promotion, and disease prevention;
- study NCPM as an effective tool for educating professionals in science-based practice; and
- train professionals to effectively and efficiently use PCC resources and techniques.

What Professionals Can Do

- Participate in the future and share your plans at ncp@eatright.org.
- Contribute data to ANDHII to support outcomes research.
- Collaborate in a translation of NCP and NCPT.
- Pursue continuing education focused on quality indicators.
- Advocate for the value that the NCP brings to the health of clients.
- Apply the NCP to create opportunities that integrate research, professional development, and practice for innovation and discovery.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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Nutrition Care Process (NCP) Update Part 2: Developing and Using the NCP Terminology to Demonstrate Efficacy of Nutrition Care and Related Outcomes

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NUTRITION AND DIETETICS practitioners around the world use the Nutrition Care Process Terminology (NCPT) to communicate the Nutrition Care Process (NCP).[1] In this article, nutrition and dietetics practitioners or professionals; dietitians; dietitians-nutritionists; and dietetic technicians, registered, are collectively referred to as professionals. The NCPT is a standardized terminology or controlled vocabulary that complements the NCP, a systematic problem-solving roadmap for planning and providing nutrition and dietetic care to individuals and populations, and researching related outcomes. Recently, a scheduled update of the NCP and Model (NCPM) was published.[2] The NCPM is the graphic representation of the NCP. The NCP includes four steps that collectively describe the unique contributions of nutrition and dietetics practitioners. These steps are Nutrition Assessment and Reassessment, Nutrition Diagnosis, Nutrition Intervention, and Nutrition Monitoring and Evaluation. A companion to the model update publication, this article reviews the background of the NCP and describes the current state and ongoing enhancements of the NCPT.[2] A further aim is to illustrate how the NCPT communicates the unique functions of nutrition and dietetics practitioners and supports the research on nutrition and dietetics care. This article replaces previous information on the use of the NCPT.

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A DECADE OF USE AND DEVELOPMENT

The NCPT, formerly known as the International Dietetics and Nutrition Terminology (IDNT), was designed to meet the definition of a controlled vocabulary as determined by the National Library of Medicine.[3] This means that the NCPT is a system of terms organized in a hierarchical structure, with definitions and cross-references used to index and retrieve a body of literature in a bibliographic, factual, or other database.[4] The NCPT was initially presented as a documentation tool for electronic health records (EHRs).[5] Of note, the IDNT became the NCPT in 2014 to emphasize its linkage to the NCP. Today, the NCPT is a tool that standardizes nutrition and dietetics-related communication beyond the health care setting and is capable of demonstrating quality of care and related outcomes.

In 2003, the Academy of Nutrition and Dietetics (Academy), formerly the American Dietetic Association, completed a review of defined health care vocabularies to evaluate whether these existing vocabularies adequately communicated the scope of nutrition care. Although several of the defined terms at the time included nutrition-focused terms, they did not describe the complete range or the specific activities performed by nutrition and dietetics practitioners.[6]

To address this gap in nutrition and dietetics terminology, the Standardized Language Task Force, composed of 12 Academy member volunteers supported by terminology consultants and Academy staff, undertook development of terminology for the NCP step Nutrition Diagnosis. Sixty-two Nutrition Diagnosis terms were published in 2006.[7] Subsequently, the Task Force developed terms for the Nutrition Assessment, Nutrition Intervention, and Nutrition Monitoring and Evaluation NCP steps. As a result, an official terminology that supported all four steps of the NCP was published in 2008.[8] Currently, the NCP Outcomes Research Committee (NCPROC) of the Academy oversees the development and maintenance of the NCPT with support from its workgroups (ie, International, Advisory, and Classification) and in collaboration with the Council on Research, Informatics, and Interoperability and Standards Committees. The complete NCPT (electronic NCPT [eNCPT]) is released once a year and is available through a web-based platform.[1] A book, the *Abridged Nutrition Care Process Terminology (NCPT) Reference Manual: Standardized Terminology for the Nutrition Care Process*[9] provides a select subset of NCP terms in print form.

The NCPT has developed in several aspects since its original launch. Several international nutrition and dietetics organizations work collaboratively with the Academy to support, adopt, and translate the NCPT into different languages (Figure 1).[10-12] Also, the application and related experiences with NCPT have been reported in various practice and education settings.[13-19] To better communicate nutrition care in practice and research, processes for

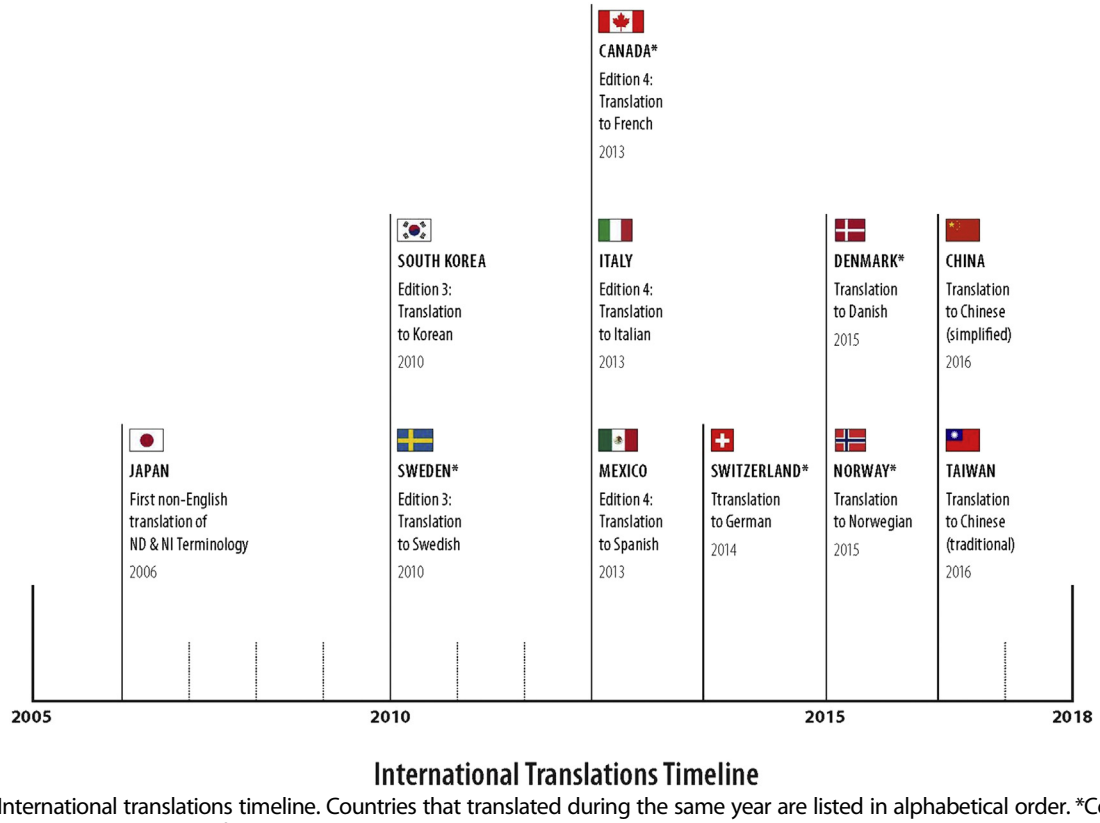

Figure 1. International translations timeline. Countries that translated during the same year are listed in alphabetical order. *Country that has conducted regular updates of the Nutrition Care Process Terminology. ND=nutrition diagnosis. NI=nutrition intervention.

modifying the NCPT have been implemented by the NCPROC that ensure a responsive environment for NCPT enhancement. As a result, the number of NCPT terms has expanded to support the range of skills and roles of nutrition and dietetics practitioners. Synonyms have been added that embrace practice and cultural sensitivities. Because the NCPT is among many health care terminologies, its terms are submitted to larger interdisciplinary international clinical terminology standards such as Systematized Nomenclature of Medicine-Clinical Terms (SNOMED-CT) and Logical Observation Identifiers Names and Codes (LOINC) on an ongoing basis.[20,21] In recent years, the NCPT has been used in practice-focused nutrition research showing the efficacy and degree of application of the NCP, as well as adherence to evidence-based nutrition practice guidelines.[18,22-24]

NCPT: THE STANDARDIZED TERMINOLOGY OF NUTRITION AND DIETETICS

The NCPT is organized by NCP steps and within each step it is organized by domains, classes, and subclasses (Figure 2). An extensive number of NCP terms have reference sheets that serve as a descriptive profile for the term. NCP terms on the reference sheets are defined in the case that they do not exist in the international clinical terminology standards described elsewhere in this article.

The purpose of the NCPT is to provide an accurate and specific description of the services that nutrition and dietetics practitioners deliver, and the investigation of resulting outcomes. This achieves a common understanding not only among nutrition and dietetics practitioners, but also outside the profession, including clients (individuals or populations) and other disciplines. Another substantial purpose of the NCPT is that it provides a means to show the influence of nutrition care on outcomes and quality of care to health professionals and the public. Regardless of chosen note format (eg, the traditional Subjective, Objective, Assessment, Plan system or the Assessment, Diagnosis, Intervention, Monitoring, Evaluation system) or other means of documentation/reporting based on policy or personal preference, nutrition and dietetics practitioners use NCPT to communicate care with precision.[23,25] Examples of the application of NCP using NCPT in a variety of practice settings are illustrated in Figure 3.

In a dynamically evolving health care environment, the vision for the NCP and NCPT is to facilitate communication within and among health care systems for outcomes research and quality improvement. Thus, the NCPT is an important tool to advance the field of nutrition and dietetics, related education, research, and policy as the updated logic model guiding terminology development demonstrates (Figure 4).

Acceptance and Adoption

The NCPT supports application of the NCP in numerous countries. The European Federation of the Associations of Dietitians *Report on Knowledge and Use of a Nutrition Care Process and Standardized Language by Dietitians in Europe*[11] reported that there were positive attitudes for the use of a standardized terminology that describes the NCP. At the time of this survey, seven European countries

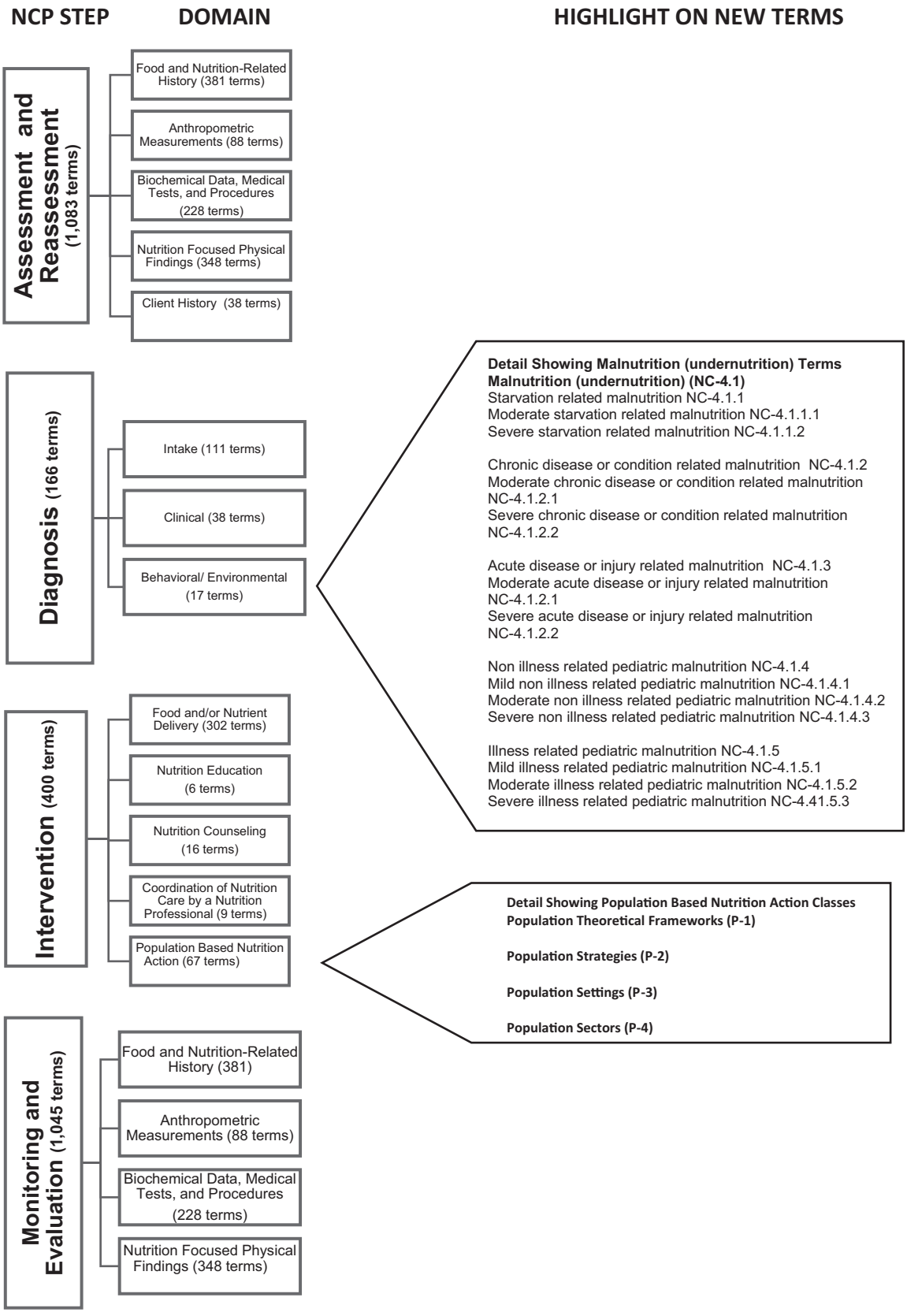

Figure 2. Nutrition Care Process (NCP) Terminology hierarchy.

Case NCP	Public Health **Situation: Women of reproductive age found with low Hgb[a] and iron-deficient diet**	Foodservice **Situation: In a natural disaster, it is estimated that 5 d are needed to repair and restore potable water supply**	Long-Term Care **Situation: Daughter of personal care home resident concerned with mother's food intake. Resident has swallowing difficulties**	Acute Care **Situation: Hospitalized female teacher with complaint of undesired weight gain. Reason for admission: emergency appendectomy**	Nonacute Care **Situation: Female teacher with complaint of undesired weight gain referred by hospital RDN[b] (Same person as in Acute Care)**
Assessment	***Food Intake*:** infrequent consumption of iron-rich foods, ***Mineral element intake*** : <67% EAR[c] for iron for gender and age, ***Nutritional anemia profile*:** Hgb: high incidence of values below the population reference standard (40% of women of reproductive age) Comparative standards: Estimated mineral needs: EAR for iron for women aged 19-50 y=8.1 mg/d Hgb >120 g/L	Availability of potable water: a 3-d supply of 1 gal (4L)/person/d as recommended by EPA[d] is available	***Food intake:*** Food consumption reported to be <50% of meals. Reduced intake progresses throughout the day with fatigue and increased signs/symptoms of dysphagia. ***Weight loss:*** 7 lb (3.2 kg) in past month (5% weight loss) ***Measured Weight:*** 148 lb (67 kg) ***Nutrition-focused physical findings:*** Mild/moderate loss of muscle mass ***Diet:*** Minced and moist Comparative standards: ***Total estimated energy needs in 24 h:*** 1,500 kcal (6,300 kJ), ***Total estimated protein needs in 24 h:*** 80 g protein/d ***Method for estimating total energy needs:*** 22 kcal/kg, 1.2 g protein/kg	***Energy intake*:** >2,200 kcal/d, (9,200 kJ/d) ***Age*:** 45 y ***Stated height:*** 5 ft 5 in (163 cm), ***Stated weight:*** 190 lb (86 kg) ***Body mass index*:** 32.4, *Obese*. ***Meal snack pattern*:** Eats when not hungry. ***Types of food meals*:** High-fat foods frequently, ***Weight gain*:** 60 lb (27 kg) in 24 mo, ***Readiness to change nutrition related behavior:*** Contemplation, expresses concern about health status Comparative standards: ***Total estimated energy needs in 24 h:*** 1,500 kcal (6,300 kJ), ***Method for estimating total energy needs:*** Mifflin-St Jeor	Weight Management RDN validates assessment data received from hospital RDN via a Transition of Care (C-CDA[e]) document. (In practice this means that all data from the acute care setting (acute care case in this Figure) were transmitted as documented to the nonacute care setting.

(continued on next page)

Figure 3. Terminology applications in a variety of practice settings. Nutrition Care Process Terminology terms are presented in boldface italic type.

Case NCP	Public Health Situation: Women of reproductive age found with low Hgb[a] and iron-deficient diet	Foodservice Situation: In a natural disaster, it is estimated that 5 d are needed to repair and restore potable water supply	Long-Term Care Situation: Daughter of personal care home resident concerned with mother's food intake. Resident has swallowing difficulties	Acute Care Situation: Hospitalized female teacher with complaint of undesired weight gain. Reason for admission: emergency appendectomy	Nonacute Care Situation: Female teacher with complaint of undesired weight gain referred by hospital RDN[b] (Same person as in Acute Care)
Diagnosis P: (demonstrative example only)[f] **E:** **S:**	***Inadequate mineral intake*: *Iron*** related to infrequent consumption of iron-rich foods as evidenced by low dietary iron consumption (<67% EAR) and low Hgb (<120 g/dL) in 40% of women of reproductive age	***Limited access to potable water*** related to lack of disaster planning as evidenced by <5 d supply of 1 gal (4 L) /person/d	***Malnutrition*** related to inadequate oral intake as evidenced by resident consuming <50% of meals, 5% weight loss, evidence of muscle wasting (SGA[g] B) and reports of fatigue and dysphagia	***Excessive energy intake*** related to consuming high-fat foods when not hungry as evidenced by ***unintended weight gain*** of 60 lb (27 kg) in 24 mo and ***energy intake*** exceeding total estimated energy needs by 700 kcal/d (2,900 kJ/d)	***Undesirable food choices*** related to consuming high fat foods when not hungry as evidenced by ***unintended weight gain*** of 60 lb (27 kg) in 24 mo and ***energy intake*** exceeding total estimated energy needs by 700 kcal/d (2,900 kJ/d)
Intervention	***Mass communication*** to promote ***Food environment change*** in ***Communities, neighborhoods and families sector.*** Goal: 50% Reduction in anemia in women of reproductive age[h]	***Team meeting*:** with food production manager, water vendors, materials manager to plan action points Goal: 5-d Supply potable water to provide 1 gal (4 L)/d/person	***Nutrition Prescription:*** 1,500 kcal 80 g protein/d, purèed diet, ***Meals and snacks: Purèed food Level 4 Green, Moderately thick liquid Level 3 Yellow*** ***Food and Nutrient Delivery:*** Change diet order to purèed with fortified foods and between-meals snacks. Implement medication nutrition supplement pass program. ***Collaboration with other providers*:** Nursing to monitor tolerance to purèed diet	***Nutrition prescription***: 1,600 kcal/d (6,700 kJ/d), ***Health belief model***, ***Motivational interviewing***, ***Referral to RDN with different expertise***. Goal: Make appointment with weight management RDN before discharge	***Nutrition prescription:*** 1,600 kcal/d (6,700 kJ/d), ***Social learning theory***, ***Goal setting***, ***Recommended modifications***: lower-fat snack choices. Goal: Altered eating habits result in weight loss of 5% of current body weight

(continued on next page)

Figure 3. *(continued)* Terminology applications in a variety of practice settings. Nutrition Care Process Terminology terms are presented in boldface italic type.

Case NCP	Public Health Situation: Women of reproductive age found with low Hgb[a] and iron-deficient diet	Foodservice Situation: In a natural disaster, it is estimated that 5 d are needed to repair and restore potable water supply	Long-Term Care Situation: Daughter of personal care home resident concerned with mother's food intake. Resident has swallowing difficulties	Acute Care Situation: Hospitalized female teacher with complaint of undesired weight gain. Reason for admission: emergency appendectomy	Nonacute Care Situation: Female teacher with complaint of undesired weight gain referred by hospital RDN[b] (Same person as in Acute Care)
Monitoring and evaluation	***Food Intake***, ***Mineral element intake***, ***Nutritional anemia profile: Hgb:*** After 3 y, modestly increased consumption of iron-rich foods (<EAR) and incidence of low Hgb (Hgb <120 g/L) not trending toward reduction. Program modified Indicator: Dietary intake of iron Criterion: >EAR Indicator: Hgb Criterion: Hgb >120 g/L	***Availability of potable water***: Water supply of 1 gal (4 L)/person/d for 5 d achieved Indicator: Water supply Criterion: at least 1 gal (4 L)/person/d for 5 d	***Food intake,*** Diet Order: Meal observation by nursing reports tolerance and acceptance of diet. ***Fluid/beverage intake***: 95% consumption of ***commercial (prepackaged) beverage*** ***Weight change: weight gain*** 3% Indicator: Percent intake of served meals snacks, and beverages Criterion: at least 95% Indicator: ***Weight gain*** Criterion: ***weight gain*** by 3%	***Readiness to change nutrition related behavior***: made appointment with weight management RDN before discharge Indicator: ***Adherence*** Criterion: Make appointment with weight management RDN	***Body mass index***, ***Meal snack pattern***, ***Types of food meals***. Eating fruit and whole grain snacks when hungry, weight reduction, confident of ability to continue Indicator: ***Body mass index*** Criterion: ***Body mass index*** <31.7 Indicator: weight reduction Criterion: 5% weight reduction of current body weight

[a]Hgb=hemoglobin.
[b]RDN=registered dietitian nutritionist.
[c]EAR= Estimated Average Requirement.
[d]EPA=Environmental Protection Agency (https://www.epa.gov/sites/production/files/2015-03/documents/planning_for_an_emergency_drinking_water_supply.pdf).
[e]C-CDA=Consolidated Clinical Document Architecture.
[f]PES=Problem, Etiology, Signs, and Symptoms.
[g]SGA=Subjective global assessment.
[h]http://www.who.int/nutrition/global-target-2025/en/.

Figure 3. *(continued)* Terminology applications in a variety of practice settings. Nutrition Care Process Terminology terms are presented in boldface italic type.

2003 Ultimate impacts (Part II, 2008)	Status of Ultimate Impacts	Assumptions	Stakeholders	2018 Ultimate Impacts
Quality, cost-effective nutrition care delivered in partnership with providers, agencies, and communities	Ongoing	• Nutrition is an essential component of high quality health care for promotion of health and prevention of disease • Data are needed to research the process and outcomes of nutrition care • Nutrition and dietetics professionals, educators, and researchers will use and enhance a standardized nutrition language • Nutrition and dietetics professionals, educators, and researchers continue to use and improve the NCP • Nutrition and dietetics professionals and researchers use standardized terminology in a database to perform outcomes management and targeted research • Nutrition and dietetics professionals improve effectiveness through collaboration • Emphasis on people-centered, value-based health care	• Health care consumers • Academy members • Academy BOD[c] • Academy HOD[d] • Other health care providers • Health care payers • Legislators and regulators • Health care researchers • International health care terminology and information management standards organizations • International nutrition and dietetics professionals and organizations	Safe, effective, efficient, person-centered, timely, and equitable nutrition care delivered in collaboration with providers, agencies, and clients
Nutrition care grows nationally	Ongoing			Nutrition care improves the health and well-being of all people
Standardized nutrition language included in dietitian education	Realization			Standardized nutrition language integral to nutrition and dietetics education
Ongoing maintenance and updates of standardized terminology accomplished by the Academy[a] and/or partners	Ongoing			Robust maintenance and updates of standardized terminology accomplished by Academy and its global partners
Evaluate a national data warehouse established for a sustainable, reliable and useful database for Academy/ dietitians/researchers	Realization			Popularize a sustainable, reliable, useful database for Academy and nutrition and dietetics research and innovation
National, state, and local policies developed and supported to foster nutrition practice, education, and research	Ongoing			Jurisdictional policies developed and supported to foster nutrition practice, education, and research
Incorporate NCP[b] and International Dietetics and Nutrition Standardized Language in to dietetics practice worldwide	Realization			Support adoption of NCP and NCPT into nutrition and dietetics practice world-wide
				NCPT[e] is the essential element linking technological innovations, and achieving interoperability in nutrition and dietetics at large

[a]Academy=Academy of Nutrition and Dietetics.
[b]NCP=Nutrition Care Process.
[c]BOD=Board of Directors.
[d]HOD=House of Delegates.
[e]NCPT=Nutrition Care Process Terminology.

Figure 4. Logic Model for standardized terminology. The goal is to provide data to foster nutrition and dietetics practice, education, research, and policy.

reported the use of IDNT. Recently, the nutrition diagnosis terms of NCPT were mapped to the International Classification of Diseases as part of a national project in Norway.[26] Japan and South Korea also adopted the IDNT.[27,28] A recent global survey of NCP/NCPT adoption and use has been completed and the results are being prepared for publication (personal communication with Elin Lovestam, June 5, 2018). From the Academy's Professional Assessment Survey, there is increasing trend of use of Academy resources related to NCP and NCPT from 2007 to 2017 (NCPRO Committee face-to-face meeting, June 5, 2017). In this survey, 20% of respondents use NCPT in structured EHRs (predefined data elements to select from), 45% in unstructured (free-text) EHRs, and 30% is a combination of structured and unstructured documentation (NCPRO Committee face-to-face meeting, June 5, 2017). These data reflect that a large portion of practitioners are still documenting electronically in free-text fields. It is important to acknowledge that upgrading EHR technology to structured form is a major and challenging change that requires resources and vested stakeholders. Academy survey data integrated with the awaited international survey will assist in developing global strategies for NCP/NCPT use and adoption.

Difficulties and challenges of implementing the NCPT have been identified by several studies. Challenges with implementation have included increased time requirement to use NCPT, concern that other health professionals will not read nutrition diagnosis statements, limited number of translations, concern that translation or dialects may lead to misinterpretations of the terminology, and patient-centered experience data may not be captured effectively (NCPRO Committee face-to-face meeting, July 13, 2017).[11] Results from a qualitative study found that Swedish dietitians expressed ambivalence toward the terminology in that some terms, especially in the environmental-behavioral domain of the Nutrition Diagnosis terminology, were harsh or offensive toward patients.[14] These surveys support that implementation strategies should include education and training, incorporation of terminology into documentation tools for health records, and culturally sensitive translation. Change-management skills and leadership support are also needed for successful implementation.[29,30]

Development and Submission Process

The NCPT communicates the profession's unique contribution to health care. The terminology grew from 62 Nutrition Diagnosis terms in 2006 to 712 NCPT terms in 2008. There are currently about 1,700 terms (Figure 2) defining the four steps of the NCP. The terminology has globally evolved from principles and initiatives to acknowledge community and public health nutrition and other specialty practices, and to achieve inclusion into standardized EHR terminologies (Figure 5). Ongoing work to maintain the terminology for an ever-changing profession is possible because of the valuable contribution of practitioners and content experts and the improved process by which terms are developed.

Throughout the early development process, the Standardized Language Task Force sought term suggestions from practitioners and subject matter experts. Forms were included within the IDNT books to encourage term submission from users of the terminology. Term submitters provided a term definition, reference sheet, and supporting evidence. Term refinement was a collaborative process between submitters and an expert terminology consultant. The expert terminology consultant also provided a recommendation for placement of the term within the terminology structure. This completed work was submitted to the committee for inclusion in the terminology.

The submission process was modified in 2014 to streamline the involvement of NCPROC, its supporting workgroups, and an expert terminology consultant. The revised process evaluates term requests and modifications from groups of subject matter experts such as Academy dietetic practice groups, Academy leaders, and NCPT users.[31]

Some important changes to the submission process include an initial review by the NCPROC to assess the term's merit in nutrition and dietetics practice before allocating consulting time or obtaining a review by the Classification Workgroup to determine whether a proposed or modified term already exists in an international clinical terminology standard such as SNOMED-CT and LOINC. If a term is progressed to the Classification Workgroup and is found to already exist in an international clinical terminology standard, the term may be readily adopted without additional development.

If a proposed term is progressed to the Classification Workgroup and is not found in existing international clinical standards, then development work may be needed. When expert agreement is reached on the proposed content, terms are approved by the NCPROC for inclusion in the next release of the NCPT.[31] Term and definition development is a consensus among experts or expert practice groups that reflects current nutrition and dietetic practice and research.

Recent examples of this approach includes terms describing the etiology and severity of adult and pediatric malnutrition, International Dysphagia Diet Standardization Initiative terms, terms to support the Nutrition-Focused Physical Examination, and the Population-Based Nutrition Action intervention terms (Figure 5).

With the increase in international NCPT use, NCPROC was restructured to ensure half the membership was based internationally. Likewise, the NCPROC Advisory Workgroup, International Workgroup, and Classification Workgroup contribute a global talent pool of subject matter experts. Thus, the NCPT evolves with new and revised term requests from a dynamic, international profession.

Translation

The eNCPT has been translated from US English into seven languages and dialects.[10] The translations are available to all eNCPT subscribers. The Academy collaborates with international professional organizations such as associations and or universities, and their translating team entities (eg, collaborators, consultants, or other appointed professionals) in an effort to make the NCPT a global language with international usage.[32]

Sweden completed its translation in 2011 and has subsequently completed four updates. Experiences from Sweden have shown the importance of creating a work group of experienced dietitians as well as having an ongoing dialogue and consensus building among the key

Principles and initiatives		Select NCPT examples
Reflect an international perspective	International leaders, experts, and reviewers are integral to the NCPT maintenance and Committee processes. US and international standards are included in resources for: • Measures • Laboratory units • Nutrient intake NCP[b] and NCPT are used in several countries. Definitions are developed to incorporate new NCPT into standardized terminologies and for accurate conceptual translation. The NCPRO[c] Committee collaborated with the International Dysphagia Diet Standardisation Initiative to develop NCPT diet terms and definitions so that the Academy[d] could submit them to standardized terminologies.[59]	• Complex carbohydrate estimated intake in 24 h (g/day) • Vitamin A estimated intake in 24 h in μg (micrograms) • BUN[a] (mg/dL or mmol/L) • Creatinine measurement, serum (mg/dL or μmol/L) • Estimated daily glycemic load (number) *Definition:* The estimated measure per day reflecting the quantity and type of all carbohydrate consumed. • Purèed food Level 4 Green • Extremely thick liquid Level 4 Green • Liquidized food Level 3 Yellow • Moderately thick liquid Level 3 Yellow
Take a people-centered approach	New term synonyms were deemed necessary for terminology considered overly judgmental.[35]	• Food and nutrition-related knowledge deficit *synonym* Limited food and nutrition-related knowledge • Undesirable food choices *synonym* Unbalanced diet • Physical inactivity *synonym* Limited physical activity
Recognize the etiology and severity of malnutrition (undernutrition)	Malnutrition was reclassified as a clinical condition with movement of the nutrition diagnosis from the Intake domain to the Clinical domain for more accurate modeling of these conditions. Malnutrition indicators from the Academy consensus papers for adults and pediatrics have been included in the NCPT reference material.[60,61]	• Moderate chronic disease or condition related malnutrition • Severe acute disease or injury related malnutrition • Mild nonillness-related pediatric malnutrition • Moderate illness-related pediatric malnutrition • Temporalis muscle atrophy • Handgrip strength • Head circumference for age *z* score • Weight for length *z* score
Characterize nutrition interventions in populations	Nutrition interventions at the institutional, community, and policy levels describe actions to address nutrition problems influenced by the environment in which people live, work, and play. Fully integrating the Social Ecological Model, a new Nutrition interventions domain, aligned the NCPT with the Centers for Disease Control and Prevention Health Impact Pyramid and the World Health Organization Population Health Promotion Model, which was adopted in the Ottawa Charter on Health Promotion.[62-64]	Population-based nutrition action • Social ecological model • Social marketing • Mass communications • Food environment change • Public policy change • Food production and provision settings • Government settings • Agriculture sector • Communities, neighborhoods, families sector

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Figure 5. Major principles and initiatives of Nutrition Care Process Terminology (NCPT).

Principles and initiatives		Select NCPT examples
Represent content for specialized practice	Practitioner-led efforts to reflect their practice and research with neonatal, long-term care, inborn errors of metabolism, gastrointestinal disorder, and community nutrition and public health populations are included in NCPT adding 781 assessment/monitoring and evaluation terms, 107 diagnosis, and 326 intervention terms since all 4 steps were published in IDNT[e] in 2008.[5]	• Breastmilk feeding attempts in 24 h • Docosahexaenoic acid estimated intake in 24 h • Total fat from intravenous fluids • Total protein per kilogram estimated in 24 h • Phenylalanine, dried blood spot • Pressure injury of hip • Excessive growth rate • Consistent carbohydrate diet • Modify composition of parenteral nutrition • Modify route of parenteral nutrition
Clarify usage of terminology	The NCPRO Committee has responded to practitioner concerns and questions by: •Providing guidance for diagnoses associated with exocrine and endocrine functions, •Relocating an indicator for gluten from a carbohydrate to a protein diagnosis because of the protein in gluten responsible for the intolerance or allergy, and •Defining predicted nutrition diagnoses that are anticipated based on observation, experience, or scientific reason.	• Altered gastrointestinal function • Impaired nutrient utilization • Intake of types of proteins inconsistent with needs • Predicted inadequate energy intake • Predicted breastfeeding difficulty • Predicted food medication interaction
Structure unique nutrition data	Removing the need for hierarchical terminology construction by creating complete terms and submitting them to standardized terminologies (ie, SNOMED CT[f] and LOINC[g]), each term is assigned a 5-digit Academy unique identifier.[20,21] This facilitates data tracking in electronic record systems. While all terms in nutrition diagnosis and intervention have external mappings, work continues in assessment. Ambiguous terms, such as suboptimal and less than optimal, have been replaced with more accurate labels. Terms that conveyed more than 1 idea have been separated for independent expression.	• Potassium estimated intake in 24 h • Serum potassium measurement • Inadequate potassium intake • Potassium modified diet • Potassium supplement therapy • Estimated potassium needs • Growth rate below expected • Intake of types of fats inconsistent with needs (specify) • Limited access to food • Limited access to potable water • Measured weight • Stated weight • Loss of subcutaneous fat overlying the ribs

(continued on next page)

Figure 5. *(continued)* Major principles and initiatives of Nutrition Care Process Terminology (NCPT).

Principles and initiatives	Select NCPT examples
Nutrition concepts (eg, loss of subcutaneous fat overlying the ribs, iliac crest abnormal prominence), and substances (eg, pantothenic acid, selenium, fruit servings, psyllium) not previously in standardized terminologies are now present for worldwide use. Some terms label procedures were revised to clarify them as nutrition and dietetic practitioner actions.	• Iliac crest abnormal prominence • Inadequate pantothenic acid intake • Inadequate selenium intake • Fruit servings estimated in 24 h • Total fiber estimated intake in 24 h • Referral to registered dietitian nutritionist with different expertise • Collaboration with other providers • Referral to community agencies/programs

[a]BUN=Blood Urea Nitrogen.
[b]NCP=Nutrition Care Process.
[c]NCPRO=Nutrition Care Process Research Outcomes.
[d]Academy=Academy of Nutrition and Dietetics.
[e]IDNT=International Dietetics and Nutrition Terminology.
[f]SNOMED CT=Systematized Nomenclature of Medicine Clinical Terminology.
[g]LOINC=Logical Observation Identifiers Names and Codes.

Figure 5. *(continued)* Major principles and initiatives of Nutrition Care Process Terminology (NCPT).

contacts (expert dietitians with varied practice experiences and other health care professionals) involved in the translation.[33] To be useful to nutrition and dietetics practitioners, a conceptual translation that is accurate, unambiguous, linguistically correct, and consistent is needed. Translating challenges include differences in culture, health care systems, legal issues, differences in the use of nutrition and dietetics terms, and references to US-specific concepts in the terminology. Conceptual translation is facilitated by clear definitions and supporting reference sheets.

The Academy welcomes translations of the eNCPT. To obtain acceptance from the Academy to translate, translators need support from their national dietetics association or equivalent professional governing entities or university. The responsibility for the quality of the translation and associated costs lie with the translating organization. A concern for the future is that the costs to complete an initial translation, subsequent maintenance, and access to the eNCPT may not be affordable for dietetics associations or other interested organizations in developing economies. There is a need for a sustainability model that facilitates and/or funds translations in less-affluent countries.

SYNONYMS: THE GLOBAL MOVE TOWARD PEOPLE-CENTERED CARE

The adoption of a people-centered care approach, sometimes more narrowly referred to as patient-centered or person-centered care, is growing globally.[34] This approach includes providing an individual full access to his or her health care information. The Organization for Economic Co-operation and Development has developed quality health care indicators, including indicators to track patient-centered care, that allow comparisons across member countries.[35,36] The inclusion of patient-centered health care measures into health care system performance assessments has occurred in many countries, including Australia, Canada, Denmark, France, Germany, Switzerland, the Netherlands, New Zealand, United Kingdom, and the United States.[34]

Leadership and cultural transformation are part of the patient-centered care journey.[37] In countries where clients have full access to their health record, it is very important to use terminology that is not perceived to be harsh or offensive. There is greater recognition for the need of people to be considered as individuals with varied needs and not as clinical symptoms. The choice of words used during an episode of care ought to reflect this philosophy. A psychologist's view regarding successful use of standardized language is that it should correspond to situations in practice, have internal coherence, and intuitive appeal to users.[38]

The provision of care and the language describing that care needs to be respectful and responsive to individual preferences and values. With the global adoption and implementation of NCPT, the terminology needs to communicate the care provided to culturally and linguistically diverse populations. Feedback from international surveys has indicated the desire for terms that are more patient-centered. The 2014 Australian NCPT Implementation Survey showed improvement in NCPT attitudes, knowledge, and use over time.[39] In that longitudinal survey, free-text comments were collected to understand the challenges or barriers related to NCPT use, in particular areas of practice. The dietitian respondents' comments included general sentiments such as, "I would cringe to write…," "Some of the terminology is quite derogatory of the client/patient," "An impersonal way of describing an interaction" and, "Culturally words have slightly different meanings. I change some words when I deem the language judgmental."

Synonym submissions from New Zealand have provided alternatives to the words *deficit* and *inability*. Specifically, "Self-monitoring deficit," "Food- and nutrition-related knowledge deficit" and, "Inability to manage self-care" are examples of terms that could make an individual feel pessimistic, discouraged, or embarrassed. An individual's personal strengths and capability may be overshadowed by a perceived critical expression. The synonym *limited* for *inability* is less judgmental, more empathetic, and is constructive with a positive regard for the individual. Utilizing the term submission process, a number of synonyms for diagnostic terms within the Behavioral-Environmental Domain were approved and included in the 2016 eNCPT release (Figure 6). Synonyms can be used interchangeably in place of the original term without altering the meaning.

NCPT INCLUSION IN CLINICAL TERMINOLOGY AND ELECTRONIC HEALTH INFORMATION MANAGEMENT STANDARDS

The Academy has been submitting NCPT terms to SNOMED-CT and LOINC since 2011, and has developed electronic health information management standards for Health Level 7 (HL7).[20,21,40] SNOMED-CT and LOINC are clinical terminology standards required for use in US EHRs and similarly used in many other countries. Both standards are used internationally in EHRs. Generally speaking, SNOMED-CT terms encompass terms from all NCP steps. LOINC includes primarily quantitative Nutrition Assessment and Nutrition Monitoring and Evaluation terms.

In the United States, terminology standards also facilitate coding the financial value of care for procedures and services using Current Procedure Terminology of the American Medical Association[41] and Healthcare Common Procedure Coding Systems G-codes.[42] These codes are maintained jointly by the alpha-numeric editorial panel with participation from the Centers for Medicare and Medicaid Services and other payer coding schemes.[43] As part of SNOMED-CT and LOINC, NCPT provides terms useful in the United States for coding social determinants of health from nonphysician clinical documentation using the International Classification of Diseases.[44,45]

The submission of NCPT to clinical terminology standards started with nutrition assessment terms to meet an urgent regulatory standard for EHRs in the United States.[46] A consequence of this process was that submissions of NCPT to the International Health Technology Standards Development Organization, now SNOMED International, were for the most part available in the US edition of SNOMED-CT and not other countries. SNOMED-CT has multiple country editions in addition to an overarching International Edition.[20] LOINC has a single edition with translations.[21]

The widespread transition to EHRs has made it apparent that there is a need to have NCPT incorporated into the SNOMED-CT International Edition. This would make NCPT available to all entities using SNOMED-CT. Recently, dietetics associations from Australia, Brazil, Canada, Denmark, Israel, Mexico, New Zealand, Norway, Switzerland, Sweden, and the United States requested inclusion of NCPT terms into the International Edition of SNOMED-CT. This request was accepted and in July 2018 all NCPT terms that were in the US edition are now available in the SNOMED-CT International Edition.[20] This is a major step forward for continued international NCPT availability and adoption.

The Academy maps and models the NCPT to SNOMED-CT and LOINC on an ongoing basis. Mapping and modeling is a process to confirm that an equivalent relationship with a term exists in a terminology standard and ensures that NCPT communicates the same meaningful information and significant facts in SNOMED-CT or LOINC. The resulting database and available nutrition standards are used by developers to match accurately NCPT to SNOMED-CT or LOINC terms when designing an EHR.[47] This may not appear as a point of interest to nutrition and dietetics professionals at first. However, in EHRs the NCPT is what the user sees and uses upfront when they document and in the back end are the SNOMED terms. EHRs store SNOMED data for later reporting and research. Thus, this matching between NCPT and SNOMED is a necessary foundation to be able to conduct large-scale quality improvement such as reporting on electronic quality measures, and/or NCP-related research. Professionals are encouraged to advocate for NCPT matching to SNOMED at their workplace EHR and work proactively with information technology staff to make this happen.

Inclusion of NCPT in the clinical terminology standards facilitates representation of NCPT in electronic health information management standards such as those of HL7.[40] This representation is fundamental to the interoperability of electronic health data and

Behavioral and Environmental Domain	
Knowledge and Beliefs	
NCP Term	Synonym
Food and nutrition-related knowledge deficit	Limited food and nutrition-related knowledge
Self-monitoring deficit	Limited self-monitoring
Undesirable food choices	Unbalanced diet
Physical inactivity	Limited physical activity
Inability to manage selfcare	Limited ability to manage self-care
Impaired ability to prepare food/meals	Limited ability to prepare food/meals

Figure 6. Nutrition Care Process (NCP) Terminology-approved synonyms can be used interchangeably in place of the original term without altering the meaning of the term. NCP=Nutrition Care Process.

records. Interoperability aims to provide a seamless, secure flow of meaningful electronic information to improve care (Figure 7).

To foster nutrition care across care settings in the United States, the Academy provides routine input on nutrition informatics developments and related needs to the federal Office of the National Coordinator of Health Information Technology. This input is aimed to update the Interoperability Standards Advisory.[47,48] A recent major development is the revision of the Electronic Nutrition Care Process Record System (ENCPRS) for international use. The ENCPRS is a functional electronic health data management standard available from HL7 that defines the necessary content and messaging for nutrition and dietetics-related documentation. ENCPRS relies on NCP and NCPT for content. Also, in the United States, work is underway to develop an HL7 standard for transition of care documentation that includes templates for describing nutrition care plans using NCP and NCPT. Terminology standards and data management are essential structures to ensure interoperability among EHRs (Figure 7).

NCPT IN RESEARCH

The NCPT as a structured terminology has begun to demonstrate its utility in providing data for research (Figure 4). As described in the NCP model update,[2] a data aggregation platform, the Academy of Nutrition and Dietetics Health Informatics Infrastructure (ANDHII), the architecture of which contains the NCPT, was used in studies to "explore the feasibility of validating malnutrition diagnostic criteria"[22] and "investigate the influence of evidence-based nutrition practice guidelines for the prevention of diabetes on both practice patterns and patient outcomes."[18] ANDHII is forging new frontiers globally. ANDHII is being increasingly used in nutrition research, education, and clinical and public health settings in the United States and around the world. This web-based NCPT tool can be especially helpful in settings where the EHR is not structured yet to capture nutrition care and/or in public health settings where a nutrition-focused evaluation framework is needed. Educators use ANDHII to teach future clinicians in classrooms, internship settings, and/or student-led clinics. ANDHII-focused activities empower students to enhance their informatics skills, apply their NCPT in practice conditions, and monitor the efficacy of their work. Other data aggregation tools that contain NCPT content can also be employed in research or quality improvement projects. Leveraging the

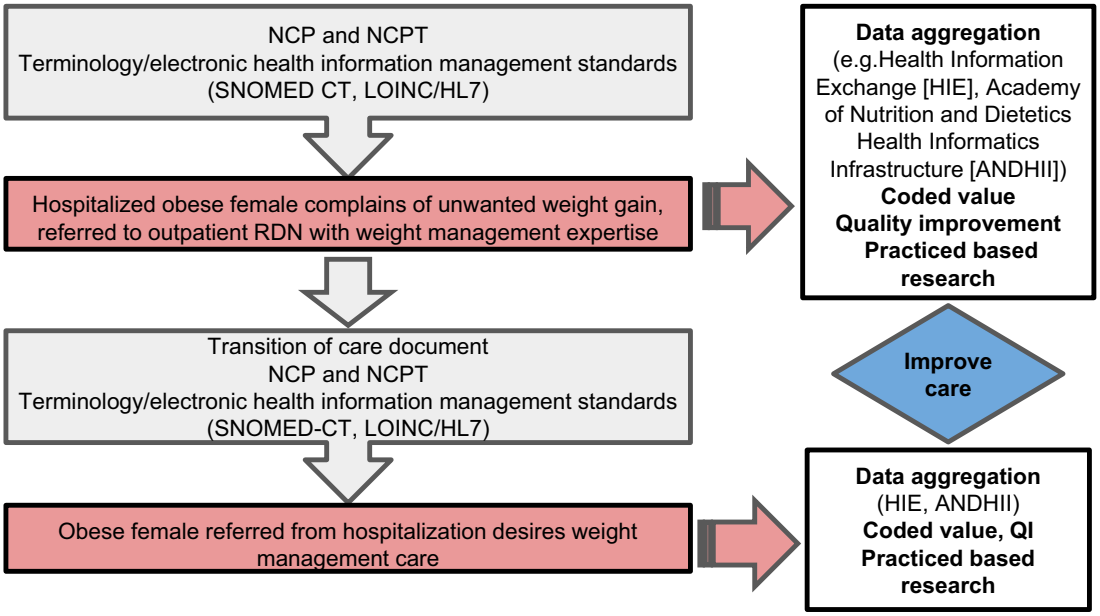

Figure 7. Interoperability schema. NCP=Nutrition Care Process. NCPT=Nutrition Care Process Terminology. SNOMED CT=Systematized Nomenclature of Medicine Clinical Terminology. LOINC=Logical Observation Identifiers Names and Codes. HL7=Health Level 7 International. RDN=registered dietitian nutritionist.

data derived from NCPT is an avenue to demonstrate effectiveness of nutrition and dietetics care.

GOING FORWARD

The adoption and consistent use of the NCPT promotes and strengthens nutrition communications among health professionals, their clients, and other customers. Several of the 2008 aspirations and goals for the NCPT have been realized (Figure 4). These include the incorporation of NCPT into EHRs and standardized clinical terminologies to communicate nutrition care. Also, expansion and revisions have occurred due to changes in the field of nutrition and dietetics. The role of NCP and NCPT in informatics is now better appreciated as NCPT becomes a part of clinical terminology and electronic health information management standards. The high interest in international translation, adoption, and enhancement of NCPT continues to grow. Further development of the NCPT in the areas of diagnosis etiology, nutrition assessment and monitoring, and evaluation status is needed. Standardization of etiologies will help reveal which types of interventions effectively resolve specific etiologies, a key part of diagnosing. This is important because the same nutrition problem can have a different etiology. Also, standardized labels for status have not been established, but these are needed because care providers and institutions use different ways to document status.

Research efforts to validate the terminology are needed. Validation improves the quality of the terminology and ensures that the terminology is used appropriately.[49] The NCPM includes guidance "to research the NCP."[2] Some work has been done toward validation of NCP terms in the United States. One study has tested the content validity of diagnostic terms using a convenience sample of registered dietitians (RDs).[50] Another study measured the reliability of nutrition diagnosis terms among RDs.[51] Finally, investigations have focused on the validation of nutrition diagnoses used by RDs specializing in cancer,[52] pediatrics,[53] and gerontology.[54] These investigations were in agreement that some refinement of the evaluated nutrition diagnoses may be warranted. An additional consideration for research is NCPT acceptance by clients and other health care providers.

The need for structured diagnosis etiologies in the NCPT is being explored. Recent research demonstrates that there is little agreement in etiology selection among professionals when assessing nutrition-related data from the same client.[55] A specific nutrition diagnosis term may be related to a variety of etiologies. It is the etiology that primarily determines the intervention to resolve or mitigate nutrition diagnoses.[2] Being able to link nutrition diagnosis etiologies or etiology categories and efficacious interventions would be useful in practice. Descriptors that define the status of diagnosis resolution are being developed.

The documentation of the intervention step needs to be further refined. The intervention consists of the plan and the implementation. The plan (which includes the nutrition prescription and goals) and the implementation of the plan could be further defined, structured, and quantified to assist professionals in designing measurable and comparable interventions. Also, defined scales to monitor effectiveness of an intervention is being considered for inclusion in the NCPT. Such progress in the terminology will facilitate outcomes research in a substantive way.

The need for ongoing professional education and training is important to highlight. Earlier cited surveys on the usage and adoption of the NCPT indicate that even countries with long-standing implementation, such as the United States, can improve the utilization of NCPT. Hence, education efforts in the future will not only target students, but also practicing and returning practitioners. Collaborative professional networks, also known as Communities of Practice and continuously updated experiential training delivered by NCP/NCPT certified trainers can be important methods to effectively reach and support a broad number of professionals. Through interactive educational methods, where learning takes place through connections formed among colleagues, learners can expand their connections and these connections drive new learning and decision making.[56] Interprofessional education that incorporates nutrition and dietetics also warrants consideration.[57]

CONCLUSIONS

Over the past decade, the Academy has successfully pioneered a standardized terminology to communicate the NCP performed by nutrition and dietetics practitioners. NCPT has been adopted, implemented, and enhanced by international professionals and organizations. NCPT has been embraced by terminology and health information management standards. The terminology has grown to include specialty practices and varied practice settings as well as culturally sensitive synonyms. NCPT growth is supported by a responsive process to accommodate new terms that address inevitable practice changes. Research tools have been created to explore NCPT implementation, its utility in describing the value of nutrition and dietetics practice, and the effectiveness in communicating quality practice that improves the health of communities. The need for training and continuing education regarding NCP and NCPT is ongoing. NCPT has become internationally essential to the field of nutrition and dietetics, intersecting technology, practice, and research for innovation and discovery.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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