

## Practice Paper of the Academy of Nutrition and Dietetics:

# Nutrition Informatics

### ABSTRACT

As valued members and decision makers of the health care team, registered dietitians and dietetic technicians, registered practice in a wide variety of settings from corporate wellness to the intensive care unit. Each of these work settings has unique information needs, but all require that dietetics practitioners have immediate access to accurate information. Successful dietetics practice in today's rapidly changing environment requires skills in finding, evaluating, and sharing accurate food and nutrition information. The term *informatics* is used to describe the science of managing, storing, and communicating information. While not required

for informatics practice, use of computers greatly facilitates management of large amounts of information. Health informatics focuses on the application of information science within the health care arena. The field of health informatics includes medical, nursing, pharmacy, dental, public health, and now nutrition informatics. Registered dietitians and dietetic technicians, registered are now creating nutrition informatics as a new area of dietetics practice. Current use of informatics in health care includes electronic health records, outcomes research, and knowledge acquisition.

There is no doubt that food and nutrition practitioners manage large amounts of information on a daily basis. The term *informatics* is used to describe how humans find, store, analyze, and manage information. Health care informatics was developed as an area of specialization within informatics devoted to management of health information. As health care is becoming more specialized, the field of health care informatics now includes a collaborative effort of interdisciplinary care aimed at provision of high quality, cost-effective health care in all settings. Nutrition informatics is an emerging area of health care informatics focusing on management of information needed for dietetics practice. Figure 1 provides terms and definitions used in the practice of health care informatics.

Information sources of varying quality abound. Widespread availability of the Internet means that information can be rapidly shared with many individuals. While methods to evaluate veracity of online information sources exist, including voluntary standards organizations, trusted professional websites, and government agencies, many are not aware that there are no penalties for publishing erroneous information on the Internet. Thus it is imperative that dietetics practitioners have a working knowledge of the fundamental concepts of nutrition informatics.

### NUTRITION INFORMATICS AND DIETETICS AREAS OF PRACTICE

In 2009 the Academy of Nutrition and Dietetics approved the following definition of *nutrition informatics*: the effective retrieval, organization, storage, and optimum use of information, data, and knowledge for food- and nutrition-

related problem solving and decision-making. Informatics is supported by the use of information standards, processes, and technology. Figure 2 illustrates some of the myriad ways that dietetics practitioners in all areas of practice utilize informatics tools.

### Existing Nutrition Informatics Resources

The Academy's resources for nutrition informatics include the Nutrition Care Process and Model (NCPM), Standards of Practice and Standards of Professional Performance, Scope of Dietetics Practice Framework, Dietetics Career Progression Guide, International Dietetics and Nutrition Terminology (IDNT), and the Electronic Health Record Tool Kit.<sup>1-3</sup> Dietetics practitioners can utilize the NCPM, Scope of Dietetics Practice Framework, and Standards of Practice and Standards of Professional Performance documents to develop a personal scope of practice for nutrition informatics. While the NCPM provides dietetics practitioners in all practice areas with a framework for critical thinking and decision making, the IDNT gives those who are providing patient care in all care settings a set of terms that can be used to describe each step of the NCP. Use of a standardized terminology such as the IDNT ensures that dietetics practice is considered an integral component of electronic health records (EHRs) in all care settings.

### WHAT IS THE VALUE OF INFORMATION MANAGEMENT TOOLS AND HEALTH INFORMATION TECHNOLOGY?

Although information management tools and health information technology (HIT) have been used in health care

- **American Recovery and Reinvestment Act (ARRA):** Also known as the “Stimulus Package,” ARRA is the federal legislation that includes billions of dollars in funding for research, education, and use of health information technology, including promotion of implementation of electronic health records.<sup>4</sup>
- **Biomedical informatics:** The interdisciplinary field that studies and pursues the effective uses of biomedical data, information, and knowledge for scientific inquiry, problem solving, and decision making, motivated by efforts to improve human health.<sup>5</sup>
- **Electronic health record (EHR):** A longitudinal repository of health information stored in digital form that can be safely and securely accessed by authorized users in all care settings.<sup>3</sup>
- **Electronic medical record:** A clinical application utilized by a health care organization to store, organize, manage, and share information about a person’s care delivered by that organization.
- **Health care informatics:** Applied research and clinical practice informatics in the combined fields of clinical informatics and public health informatics.<sup>5</sup>
- **Health information exchange (HIE):** Safe and secure communication and sharing of health data between health care organizations and/or providers.<sup>6</sup>
- **Health information technology (HIT):** Tools used to collect, store, and exchange health information in an electronic environment.<sup>7</sup>
- **Interoperability:** The interconnection of different health technologies across distributed health care systems.<sup>8</sup>
- **Meaningful use (MU):** A set of criteria for EHR implementation and use specified in the Health Information Technology for Economic and Clinical Health Act provisions of ARRA that providers and organizations must meet in order to qualify for incentive funds. The three main criteria specified under meaningful use include: a) use of a certified EHR in a “meaningful manner,” b) use of certified EHR technology for exchange of health information, and c) use of certified EHR technology to submit quality and other measures.<sup>5,9</sup>
- **Nutrition informatics:** the effective retrieval, organization, storage, and optimum use of information, data, and knowledge for food- and nutrition-related problem solving and decision making. Personal health record: A tool used by individuals to gather, track, and share information about their health status. Personal health records can be either free standing or interfaced (connected) to an EHR supported by a health care provider or organization.<sup>10</sup>
- **Protected health information (PHI):** The privacy rules of the Health Insurance Protection and Accountability Act define protected health information as: “information, including demographic data, that relates to an individual’s health conditions, as well as treatment and payment for treatment of the conditions, and gives a reasonable basis for identification of the person.” Most common identifiers, including name, date of birth, and social security number are considered to be protected health information.<sup>11</sup>
- **Smart phone:** A device that combines features found in personal digital assistant with a cellular phone. Smart phones typically include high resolution cameras, wifi capability, web browsers and the ability to download and use small applications.

**Figure 1.** Terms and definitions used in the practice of health care informatics.

since the 1960s, until the past 15–20 years use was limited mainly to finance and billing applications. In 2001, the Institute of Medicine publication, “Crossing the Quality Chasm”<sup>6</sup> described major challenges facing the US health care system, which included rapid advances in science and technology combined with a population burdened by increasingly complex health care needs. Health care systems were described as fragmented, suffering from poor communication, and overburdened with paperwork.<sup>6</sup> In addition, improvements being made in quality of care were not commensurate with ongoing increases in the cost of providing care.<sup>7</sup> It became obvious that there was a need to rapidly translate growing knowledge in science and technology to facilitate improvement in care provided. One solution brought forth was to reinvent the nation’s health care system using HIT to support the changes needed. As a result of this, greater attention has been given to development of HIT solutions that “bridge the gap between the care Americans receive and the care they expect to receive.”<sup>6</sup>

Well-designed HIT has the ability to support transformational change in how health care is provided. When properly functioning HIT systems are in place users have timely access to needed information regardless of the setting. According to Friedman the “person working in partnership with an information resource is ‘better’ than that same person working unassisted.”<sup>8</sup>

Information stored in paper files can be lost or damaged. Manually entered information is at risk for transcription or translation errors, particularly when handwriting is difficult to decipher. Electronic health records (EHRs) that are managed

correctly are significantly safer and easier to access. When information is stored in secure formats with appropriate back up, risk for damage or loss is greatly mitigated.

Full integration of HIT across all care settings requires that providers, patients, and health care organizations be able to safely and securely share information. Development of methods for health information exchange means that health information stored within an electronic medical record (EMR) held by one health care organization is made accessible to authorized users through interoperability.<sup>9</sup> An individual’s health care may be provided by several clinicians in different settings, making secure information sharing a vital component of health care informatics. Interoperable systems use agreed upon data standards to ensure that information flows quickly and accurately between providers and organizations.<sup>10</sup> Health Level 7 (HL-7) is an organization that develops data exchange standards for use in EHRs; the most recent version of HL-7 standards (version 3) is being implemented to facilitate data exchange in the United States.<sup>11</sup> Representatives from the Academy are participating on several HL-7 workgroups, thus ensuring that important nutrition information is accurately represented and transmitted between organizations and providers.

### Specific Examples of the Value of HIT

**Computerized provider order entry (CPOE):** Health care providers with clinical privileges are ultimately responsible for ordering medications, tests, procedures and other actions during an episode of care. Traditionally, these orders were hand written in paper-based medical records by the provider

Area of practice	Potential applications of nutrition informatics
Community Nutrition	Compile and analyze data regarding foodborne illness outbreaks Population food intake analysis using information from vendor databases Individualized nutrition education provided in the client's home Aggregate nutrient analysis for clients (eg, school districts, congregate dining facilities) Communication with patients/clients and providers via personal health record Evaluation of food distribution systems
Clinical Nutrition	Clinical documentation via electronic medical record Creation of clinical decision support system tools, alerts, and reminders Integration of peer-reviewed literature at point-of-care Integration of Nutrition Care Process Querying database for quality improvement Remote care and telemedicine
Consultation and Business Practice	Survey development and management (customer satisfaction, business opportunities) Supply chain management Financial management and analysis Cost-benefit analysis for efficiency and effectiveness Merge and analyze data from multiple sources
Food and Nutrition Management	Staff training and development Scheduling and event management Staffing and workload statistics Analysis of menus and recipes, menu planning Access to information sources to forecast future trends Policy development based on workflow analysis and redesign
Education	Specialty testing and certification Distance education course management software Professional course development Scheduling and tracking student progress and supervised experience
Research	Access to large shared databases for research using secondary data analysis Product and system development Web-based search tools (PubMed, Ovid, CINAHL) Project management tools for use by research teams Integration of genomics and metabolomics

**Figure 2.** Examples of nutrition informatics applied to dietetics areas of practice.

or by another person who had been authorized by the provider to write the order(s). Only individuals who had access to the paper-based medical record had access to the complete set of orders. Accuracy of the orders written depended on several factors including handwriting legibility, accurate transcription, use of understood abbreviations and acronyms and provider knowledge regarding any unique characteristics of the patient. Each of these factors has been noted to contribute to medical errors associated with the order-entry process.<sup>12</sup> It is hoped that computerized entry of medical orders will reduce errors associated with paper-based order entry. Use of CPOE also allows incorporation of alerts and reminders that may further support safer patient care.

Combined with decision support software, CPOE has the potential to prevent medical errors by ensuring that orders are legible, entered correctly, and checked for potential allergies or adverse reactions.<sup>13,14</sup> However, successful implementation of CPOE is difficult and complex and to date, studies demonstrating a clear-cut advantage of CPOE in preventing medical errors are lacking.<sup>14,15</sup> Lack of attention to user interface and workflow can lead to user rejection of CPOE.<sup>16</sup> The complexity of nutrition orders such as modified diets and enteral and parenteral nutrition necessitates that dietetics

practitioners are involved in creating order sets for nutrition interventions. Dietetics practitioners responsible for creation of order sets for nutrition care must have solid understanding of the principles of user-centered design in order to ensure successful implementation and use. It is not sufficient to simply translate paper-based order sets to an electronic format.

**Clinical decision support systems (CDSS):** For some health conditions there is a gap between care that should be provided and care that is provided.<sup>17</sup> CDSS can be used to provide information at the point of care in order to enhance decision-making. A unique feature of CDSS is that information provided is specific to the patient and the situation.<sup>18</sup> While CDSS shows much promise, clinicians have not been universally enthusiastic about using CDSS systems. Reasons cited include slow speed, the need to seek out information in the system, lack of seamless integration with workflow, and inadequate updates to the system.<sup>19</sup>

The Academy's Evidence Analysis Library (EAL) gives dietetics practitioners powerful tools for use in decision-making within the NCP.<sup>20</sup> Practice guidelines are available for a wide variety of health conditions, including diabetes mellitus, HIV/AIDS, critical illness, and disorders of lipid

metabolism. Information from the EAL has the potential to be integrated with CDSS to give clinicians real time access in order to optimize nutrition therapy.

When the EAL is not utilized as a knowledge source for CDSS, dietetics practitioners must be aware of the basis for nutrition-related information embedded in CDSS. Facilities may develop their own knowledge source or, more commonly, purchase subscriptions from publishers. Regular review of the knowledge source is important as new information becomes available or guidelines for care are updated.

### Rate of Adoption of HIT: Implications for Dietetics Practitioners

In spite of the purported benefits to the use of HIT, rates of adoption have been less than expected in all care settings. There are most likely many complex reasons that providers and organizations have been slow to adopt HIT. While many hail the potential of the Health Information Technology for Economic and Clinical Health (HITECH) provisions of the American Recovery and Reinvestment Act (ARRA) to act as a driver for HIT implementation, in reality, the financial incentives for providers and health care systems fall far short of the costs incurred to implement HIT.<sup>21</sup> Recognizing these barriers, HITECH also includes support systems to assist providers in implementing HIT. If the expected benefits of HIT are to be realized, careful and thoughtful attention must be given to design, implementation, and support of HIT systems.<sup>22</sup>

One of the more difficult aspects of HIT adoption is user acceptance. HIT users do not always enthusiastically embrace technology in the workplace, sometimes with disastrous results.<sup>23,24</sup> Close attention to user needs, both spoken and unspoken, can be an important factor in successful HIT implementation. Open communication is needed between users and developers.<sup>25</sup> Ideally, those responsible for creating HIT have experience as clinicians or a solid understanding of user workflow and expectations. Clinicians who have accepted responsibility for HIT projects must understand the demands faced by information technology professionals. While current regulations require adoption of HIT by providers and organizations, that requirement will not guarantee successful or sustained use.

Reasons for problems with HIT implementation and use can often be traced to *sociotechnical interactions*, defined by Harrison and colleagues as, “The interplay between new HIT and the provider organization’s existing social and technical systems.”<sup>26</sup> Some of these interactions include feelings of loss of provider autonomy as well as uncertainty regarding costs, changing regulations, and policy implications.<sup>27</sup> Thus, registered dietitians (RDs) and dietetic technicians, registered (DTRs) desiring to increase chances for successful HIT implementation must be familiar with HIT tools available, but also must have an understanding of how those tools interact with workflow,

organizational culture, social interactions, and technology currently in use.<sup>26</sup>

Just as the reasons for resistance to use of HIT are complex and multifactorial, successful implementation and use of HIT is most likely supported by a complex interaction of factors. Providers must feel that there is buy-in and support from the organization and payers in general.<sup>28</sup> In addition, users must perceive that HIT is useful, that it is easy to use and that use of HIT will improve job performance.<sup>29</sup> Dietetics practitioners are uniquely poised to lead and facilitate adoption of HIT through a unique mix of knowledge and skill regarding motivational and behavior change factors associated with HIT. Application of these skills to HIT adoption will provide opportunities for leadership roles for RDs and DTRs with knowledge, skills, and training in nutrition informatics.

### WHAT TECHNOLOGY AND APPLICATIONS ARE CONSUMERS, PATIENTS, AND CLIENTS USING TO MONITOR AND ADDRESS THEIR NUTRITION CONCERNS?

Over two-thirds of households in the United States now have high-speed Internet access. In 2007, more than half of adults in the United States reported using online search tools to find information regarding health and wellness.<sup>30</sup> In addition, popularity of smart phones and tablet devices that connect to the Internet wirelessly means that users can connect to the Internet wherever there is a wireless signal. Health care professionals, including dietetics practitioners must be aware of consumer trends in HIT use and develop plans to safely and securely incorporate HIT and nutrition informatics into practice.

Growing interest in online health, nutrition, and wellness information has resulted in development of a wide variety of online resources for consumers, patients, clients, and health care professionals. These resources range from simple online information searches to Internet-based disease management tools. As consumers become familiar with and use Internet-based resources they are expecting that their providers are equally fluent in use of the Internet as a tool for provision of health care. Figure 3 describes some of the ways that consumers interact with and use HIT tools.

As consumer use of online health resources grew, the term *e-health* was used to refer to “health services and health information delivered or enhanced through the Internet and related technology.”<sup>31</sup> Throughout the 1990s rapid growth in availability of information online combined with a shift from inpatient to outpatient provision of health care led consumers to seek answers to their health-related questions from online resources. As early as the 1990s there were calls for guidelines or standards to ensure that online information was accurate and truthful.<sup>32</sup> However, dietetics practitioners must be aware that there are no mandatory standards relating to accuracy of online information calling into question the accuracy of some online nutrition information.

Level number	Description	Definition
1	Search health information	Used by those with new diagnoses and disorders in preparation for provider appointments. Searching might be for the individual or for someone else.
2	Use e-mail	Communicate with friends and relatives about health care issues.
3	Seek guidance	Seek out and share information with another person who has the same health condition.
4	Use online support groups	Participate in online support groups for persons with a given condition. Group members share experiences and ask questions on forums or email lists.
5	Organize work groups	Join with others to conduct information searches or similar projects related to their condition.
6	Use online medical guidance	After entering specific information about health conditions, receive health profile information about risk factors, possible medication side effects, and other issues.
7	Interact with volunteer online health professionals	Use websites that have health care providers available to answer questions specific to the consumer's health condition.
8	Use paid online health professionals	Use paid health care professionals for online consultation, second opinions, or answers to specific questions. These professionals might include physicians, nurses, registered dietitians, or health coaches.
9	Communicate with local health care providers	Using personal health records allows consumers to directly connect to their health care providers via secure messaging services.
10	Receive "push" messages from providers	Receive email or text messages from providers in order to remind them to take certain actions, such as reminders to exercise, take medications, etc.

**Figure 3.** Ten levels of online consumer interaction with health information technology<sup>40,41</sup>

### Web-Based Delivery of Nutrition Interventions

Consumers and providers are taking advantage of widespread high-speed Internet access to develop web-based treatments for chronic health conditions. A review of web-based weight loss programs found that effectiveness varied greatly with most programs having a high rate of attrition.<sup>33</sup> More consumers are looking to health care professionals to guide them in choosing online information sources.<sup>34</sup> Therefore, dietetics practitioners need working knowledge of the types of nutrition interventions available online. Dietetics practitioners who evaluate websites for their clients must be able to determine if information presented is valid and reliable. It is also important to consider website accessibility for clients who may require accommodations for vision or hearing loss in addition to other health concerns.

### First, Do No Harm: Is Online Health and Nutrition Information Accurate?

Because there are no standards related to information accuracy consumers and providers are responsible for determination of truthfulness of information. Often consumers lack skills needed to find and evaluate health and nutrition-related information. An evaluation of websites with a nutrition focus found that while many were "aesthetically pleasing," information found was often inaccurate.<sup>35</sup> In response to growing concerns about the veracity, timeliness, and safety of health-related information found online, voluntary information quality standards have been developed. One such standard, the Health on the Net Code, provides

voluntary certification for websites wishing to demonstrate an intention to provide "quality medical information through... objective and transparent information."<sup>36</sup> Health on the Net certification is typically found on a website's home page.

Evaluation of online nutrition and health information requires that users have adequate health literacy skills. *Health literacy* has been defined as: "The degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions."<sup>37</sup> Glassman further notes the need for e-health literacy skills that include computer and information literacy for optimal use of online health information.<sup>37</sup> Dietetics practitioners must themselves possess online health literacy skills in order to assist patients/clients who use HIT tools with a critical view towards the quality and accuracy of information resources in support of health and wellness activities.

### WHAT DO DIETETICS PRACTITIONERS NEED TO KNOW ABOUT CONSUMER INFORMATICS?

Health care providers and organizations have recognized that HIT has great potential to support patients/consumers who have acute or chronic health conditions. However, patients/consumers may not always be fully accepting of HIT or may not use HIT tools as intended. Reasons for lack of acceptance and use vary. Although age is often cited as a factor associated with consumer HIT use, one systematic review found that while age was associated with likelihood of HIT acceptance, this relationship was not consistent.<sup>38</sup>

Dietetics practitioners desiring to develop consumer HIT must be able to view consumer HIT from the perspective of each specific user. *User-centered design* is a term used to describe methods used to create consumer HIT tools that have usability and accessibility as key components of development rather than as an afterthought following completion of development.<sup>39</sup> Traditional HIT development includes an evaluation of target group demographics followed by design based on what developers think that users as a group would require.<sup>39</sup> Research has found that careful attention to user needs and challenges is a vital component of successful consumer HIT implementation.<sup>40</sup>

### Consumer Health Informatics Tools

Consumer health informatics tools include personal health records (PHRs), smart phone applications, condition specific websites and social networking websites. Dietetics practitioners who wish to interact with patients/clients in electronic environments should be aware of available consumer HIT tools and their intended use. For example, smart phone applications aimed at assisting active adults with tracking and managing diet and exercise would not be attractive to older adults who need support with management of type 2 diabetes. Following are some examples of current consumer informatics tools.

### Personal Health Records

Consumers today have most likely had some interaction with computers and technology (eg, ATM access, on-line purchases, and web portals) in their day-to-day life. More frequently, patients/clients are using PHRs to store, manage, and share information about their health status. PHRs can be linked to a provider/health care organization's EMR or can be free standing applications.

While health care providers or organizations have control over information stored in the EMR patients/clients have control over information stored in their PHR, which may or may not be associated with a health care organization's EMR. When using a free-standing PHR, the user is responsible for entry of accurate information. Data from an EMR would typically flow to an interfaced PHR. Data security is a concern; patients/clients must feel secure that information they enter is accessible only by those with authorization: while providers with data must feel secure that information entered by the patient/client is accurate.

ARRA includes incentives for health care organizations and providers to adopt and use PHRs. There is a great opportunity for dietetics practitioners to become involved with development of PHRs. Use of a PHR gives patients/clients the opportunity to keep track of diet, weight, exercise, data related to self-monitoring of health conditions, medication management, and other information that can be shared with dietetics practitioners in management of health conditions. PHRs are an important component of emerging telehealth applications.<sup>41</sup>

While knowledge about the potential benefits of PHRs is growing, barriers to adoption remain. Two areas of concern include data safety/security and time needed for data entry. Ideally, information in a PHR would be shared with the patient/client's other health care providers in order to avoid redundancy in data entry. For example, if height and weight are entered into the EMR at a clinic visit there should be no need to re-enter the same information into the PHR. When information is shared like this, time is saved and potential sources of error are minimized. However, patients/clients will need reassurance that their personal health information is not available to those who do not have permission to access.

Secure exchange of information between EMR and PHR can alleviate another barrier to adoption—the need for manual data entry by the patient/client. Manual data entry is not only time consuming but also introduces risk for errors in data entry as well as missing data when entries are forgotten. Development of home-based technology that connects via wireless or hard-wire to the patient/client's PHR will help alleviate some of this problem. When working with patients/clients dietetics practitioners must be aware of current standards for exchange of information over networks as well as the patient/client's information sharing capabilities.

Concerns surrounding information exchange between patients/clients, providers and PHRs include communication between the patient/client and provider. When e-mail is used for confidential patient communication, security becomes an issue, even when an encrypted email account is utilized. To alleviate these concerns, many PHRs that are supported by health care organizations include the ability to utilize secure messaging services. Secure messaging functions like email. The difference between secure messaging and email lies in the additional security provided by embedding secure messaging in the password protected PHR. Dietetics practitioners must understand the different types of communication security and should refrain from use of non-secure email for communications with or about patients.

### Smart Phone Applications

Current cellular telephone technology literally puts a powerful miniaturized computer into consumers' hands. Smart phones have the capacity to search the Internet, communicate with others via voice, e-mail, and text (SMS) messaging, and to store and share information. There are thousands of smart phone applications (apps) related to diet and nutrition. Users must be able to determine appropriateness of these apps, thus creating a role for knowledgeable dietetics practitioners in facilitating consumer use of smart phone apps.

In addition to commercial apps, health care organizations are developing smart phone tools designed to assist patients in managing chronic health conditions.<sup>42</sup> These tools must be designed with the end user in mind, as features that might be desirable for adolescents with diabetes might have little applicability to diabetes management in adults.<sup>43</sup> Features must also be specific to specific health behaviors associated

with a given health condition, such as exercise endurance in patients with chronic lung disease.<sup>44</sup> Many smart phone applications used in chronic disease management include a mechanism for feedback and communication with health care providers. With continued growth in use of smart phones in health care, there will be an increasing need for dietetics practitioners with expertise in app development.

### Social Networking/Condition-Specific Sites

Today, millions of individuals utilize social networking websites such as Facebook, to share information about their daily lives. Use of social networking sites has grown exponentially with an estimated 250,000 new users every day.<sup>45</sup> Social networking allows users to form and join groups organized around a particular focus. Farmer and colleagues found that approximately 47% of user groups could be described as patient/caregiver support groups.<sup>45</sup>

Persons with chronic health conditions and those caring for them often report lack of satisfaction with traditional models for health care delivery. Therefore, individuals with chronic health conditions have found condition-specific online communities where they can share information about themselves, their condition, and feelings about their condition. Other community members often have the same or similar experiences and may offer tips for symptom management, therapies, and daily life. Thus, condition-specific communities may facilitate improved self-management by people with chronic health conditions.

Patients Like Me<sup>46</sup> is an example of a condition-specific social networking website that allows users to form communities as well as to share specific information that can be used to evaluate outcomes of therapies used. Data generated by user input can then be presented to users in the form of graphs and reports to assist patients in decision-making regarding traditional and alternative treatments. Emerging research shows that community members are using these reports to provide information regarding treatment side effects, provider choice, and medication/symptom management.<sup>47</sup> A unique aspect of Patients Like Me is the ability to use patient-generated data to study interventions used, treatment adherence, side effects of therapies, and patient satisfaction.<sup>48</sup> Thus, condition-specific websites offer dietetics practitioners a unique mechanism to connect with patients/clients and to evaluate how well nutrition interventions are working in real world conditions.

### CURRENT REGULATORY CLIMATE REQUIRES USE OF CLINICAL INFORMATION SYSTEMS

Passage of the HITECH provisions of ARRA in 2009 meant that health care professionals and organizations needed to take necessary steps towards implementation and meaningful use (MU) of EMRs. ARRA included over \$19 billion aimed at promoting adoption and use of HIT by health care providers and organizations. Although rates of HIT adoption are increasing, in 2009 approximately 17% of health care providers and 10% of hospitals reported

significant use of HIT.<sup>21</sup> This year saw initial phasing in of one of the more controversial components of HITECH, the provisions of meaningful use. Health care providers (eligible providers [EPs]) and organizations can become eligible for financial incentives if they can demonstrate implementation and MU of certified EMR systems.<sup>49</sup> The Academy has been involved in implementation of MU through submission of comments on proposed rules. Although at this time dietetics practitioners are not included as EPs, it is important to understand the impact of MU on how other EPs and health care organizations implement and use HIT. MU includes 25 objectives/criteria for EPs and 24 objectives/measures for health care organizations that are sub-categorized into core requirements and menu requirements. All of the requirements in the core set (15 for EPs and 14 for health care organizations) must be met in order to demonstrate MU. Core requirements that have a relationship to dietetics practice include:

- computerized order entry for medications and other orders;
- drug allergy checks;
- medication lists;
- vital signs; and
- ability to share information.

Information safety and security is also a key component of MU. The Health Insurance Portability and Accountability Act (HIPAA) was initially created as a mechanism to protect worker's access to health insurance when they change jobs. The Privacy Rule of the administrative simplification provisions (2003) of HIPAA included requirements to establish national standards that enable safe, secure electronic transmission of health information. Health care providers, including dietetics practitioners, are required to follow the privacy rule when electronically sharing protected health information.<sup>50</sup> The HIPAA privacy rules apply to all uses of protected health information, including EMRs, e-mail, and social media.

### WHAT ARE THE SKILLS THAT FOOD AND NUTRITION PRACTITIONERS NEED TO HAVE?

In order to survive and thrive in today's complex, highly technical world, dietetics practitioners require at least basic skills in nutrition informatics. Although the basic concept of informatics practice does not require use of computers, in reality management of large amounts of information is vastly improved through use of computers and technology. Therefore, core curricula of dietetics education should include computer literacy as well as information literacy skills. Depending on the practice setting and job duties, additional computer skills may be required.

Although there is little research focused on dietetics practice, research from other health professions provides some insight into knowledge and skills that dietetics practitioners would

need in all areas of dietetics practice.<sup>51</sup> A pivotal discussion relates to the need to discern those health care informatics skills that are required by all of the health care disciplines from the skills that are discipline specific.<sup>52</sup> Although work focused on identification of shared competencies continues, the American Board of Medical Specialties formally recognized medical informatics as a subspecialty for physicians who have primary professional certification.<sup>53</sup> In 2008 the American Medical Informatics Association and the American Health Information Management Association published a joint set of core competencies for individuals working with EHRs.<sup>54</sup> Five knowledge domains were identified including:

- health information literacy and skills;
- health informatics skills using the EHR;
- privacy and confidentiality of health information;
- health information data technical security; and
- basic computer literacy skills.<sup>54</sup>

A suggested set of computer literacy skills for dietetics practitioners at all practice levels is included in Figure 4.

Nutrition informatics encompasses information literacy as well as computer literacy skills.<sup>55</sup> While computer literacy skills focus on the tasks associated with safe use of computers, information literacy includes the cognitive skills needed to utilize information to ensure safe, high-quality dietetics practice. Figure 5 includes information literacy skills necessary for dietetics practice.

### Nutrition Informatics Skills Specific to Levels of Dietetics Practice

**Competent:** Upon entry to the profession, dietetics practitioners are considered to be practicing at the competent level. A competent dietetics practitioner should have achieved the basic computer and information literacy skills described in Figures 4 and 5. At a minimum, competent dietetics practitioners would:

- understand instructions for use of clinical information systems, in order to find information related to patient care;
- correctly use EMR/PHR as required in practice setting to document patient care;
- manage user security to protect patient/client information;
- follow organizational policy and procedure for corrective action when incorrect data is entered into an EHR;
- know the difference between structured and free text data and the implications of each type of data entry;
- evaluate validity of information retrieved from internet searches;

- utilize computer software to create documents and presentations appropriate for the intended audience;
- utilize social media tools appropriately;<sup>56</sup> and
- determine accuracy of information found in response to need for answers to questions related to practice setting.

**Proficient:** Dietetics practitioners who are more than 3 years from entry to practice and who have achieved operational job performance skills are considered to be at a proficient level of practice. There are currently no certification programs or advanced degrees in nutrition informatics. In order to achieve proficient practice in nutrition informatics dietetics practitioners would need to seek training in another area of health care informatics. It may also be possible for the dietetics practitioner to become eligible for certification in health care informatics through other organizations.

In addition, dietetics practitioners who have job functions and sufficient experience in health care informatics would be considered to function at the proficient level. At a minimum, dietetics practitioners functioning at the proficient level would have the following skills:

- lead project management tasks in an organizational setting;
- advise others on appropriate use of social media;
- train others on use of clinical information systems, nutrition informatics tools, and other technology topics;
- function as a member of an EHR work group;
- understand the conceptual framework of at least one health care terminology (eg, IDNT); and
- as a member of the research team, participate in nutrition informatics research.

**Expert:** The role of dietetics practitioners who are at the expert level in nutrition informatics is most likely similar to that of the nursing or medical informatics expert.<sup>57</sup> Health care informatics is a relatively new field of study with many programs offering certificates and degrees at the undergraduate and graduate levels. Consensus regarding knowledge and competencies required for entry level health care informatics practice is lacking, although emerging data suggest that there is a common set of competencies needed for practice in some of the subspecialties of health care informatics.<sup>58</sup> Recent approval of the subspecialty of medical informatics by the American Board of Medical Specialties will most likely lead to development of more unified curricula for other areas of specialization within health care informatics.

Dietetics practitioners who are practicing at the expert level in nutrition informatics have a solid understanding of EHR systems including system build, user interface development and integration of health care terminologies into an EHR. Development of the IDNT by the



- Demonstrate principles of computer file organization including information storage, data protection (backing up data), and basic computer skills.
- Demonstrate basic proficiency with use of selected operating systems (eg, Mac OS, Windows, Linux).
- Use basic software applications to create documents, spreadsheets, and presentations.
- Access and use a web browser to find information.
- Demonstrate proper use of email, including sending, receiving, forwarding, storing, and attachments. Use proper email etiquette.

**Figure 4.** Suggested computer literacy skills for dietetics practitioners at all levels of practice.<sup>61,64</sup>

- Quickly identify, evaluate, and disseminate accurate information to consumers and other health care professionals.
- Manage user security to protect patient/client information.
- Retrieve a reasonable number of relevant documents using PubMed to search the Medline database.
- Find and evaluate online information sources using appropriate search engines.
- Understand appropriate use of social media tools.
- Familiarity with basic functions of clinical information systems (eg, computerized provider order entry, results reporting, documentation, report generation).

**Figure 5.** Information literacy skills for dietetics practitioners at all levels of practice.

Academy presents experts in nutrition informatics with the opportunity to utilize database management skills to ensure appropriate use of the IDNT in structured data entry.<sup>59</sup> At a minimum, dietetics practitioners at the expert level in nutrition informatics would have additional formal training in health care informatics to include the following skills:

- supervise project managers responsible for the organization's HIT project management functions;
- lead transformational change management at the organizational level;
- evaluate new and emerging technologies to determine utility across health professions;
- complete understanding of the details of the clinical information system life cycle;
- know health care terminologies, what they are, how they are developed, and how they are utilized in EHRs;
- assign nutrition informatics tasks to subordinates using knowledge of the skills needed to meet organizational goals;
- determine workload needed for clinical information system implementation, maintenance, and upgrade;
- author request for proposals (RFP) for vendor input regarding EHR implementation or upgrade using input from others;
- understand completely how EHR systems work, including system interface builds, database specifics, workflow analysis, user interface, and information security;

- author policies and procedures for use of EHRs; and
- lead research in nutrition informatics.

#### Detailed Descriptions by Practice Area

**Clinical:** Dietetics practitioners in clinical nutrition must be familiar with the powerful tools provided by EHRs. Clinical nutrition managers (CNMs) might utilize EHRs to track complications associated with enteral or parenteral nutrition, to schedule staff based on trends in patient census, or to study outcomes of nutrition interventions. CNMs also use HIT tools to develop workable solutions to problems identified in components of the EHR such as CPOE for ordering complex diets. When dietetics practitioners have a solid understanding of the principles of workflow, user-centered design, system capability, and information flow, it is possible to create tools that ensure timely, safe, accurate transmission of information regarding nutrition care. RDs often have well-developed collaborative skills that, combined with additional education and training in nutrition informatics, make them invaluable members of any healthcare informatics project.

Clinical RDs also use HIT to ensure that they provide high quality, safe patient care. Using search tools such as PubMed it is possible to rapidly find information to support decisions made in patient care. Evidence-based practice tools such as the Academy's EAL and the Cochrane Collaborative include guidelines, recommendations, and systematic reviews of the literature that can be rapidly accessed to answer questions that arise during patient care.

As progress is made towards full implementation of the EHR in all health care settings, including long-term care, dietetics practitioners in clinical nutrition will use HIT to document care, provide patient education, and collaborate with others

to ensure safe transition of care within and between health care organizations.

**Private Practice:** Dietetics practitioners in private practice will most likely need to develop nutrition informatics skills to facilitate use of HIT in documenting and communicating provisions of medical nutrition therapy. Implementation of new technology or upgrades to existing technology can be expensive and must be made through informed decision making. Due to the complexity and expense of these systems, RDs and DTRs in private practice must be able to evaluate needs in order to avoid costly errors in purchasing and implementation of HIT in private practice.<sup>60</sup>

Dietetics practitioners in private practice who rely on referrals from other health care professions must also understand the requirements for use of EHRs to share information related to patient care. The MU provisions of HITECH require that EPs purchase, implement, and appropriately use certified EHRs. Although not currently considered to be EPs, dietetics practitioners may encounter roadblocks to referrals when they accept referrals from other EPs.

Additional concerns for dietetics practitioners in private practice surround ensuring that information provided to patients/clients is current and accurate. Individuals in solo practice are responsible for searching for and evaluating information found via web searches. Safe, effective practice requires constant surveillance and evaluation of information.

**Food Manufacturing and Foodservice:** Accurate information regarding food and nutrition products depends on strict adherence to principles of database management. Dietetics practitioners with responsibilities for management of food manufacturing and food service must be able to create and maintain databases of foods, recipes, and food ingredients. These individuals should understand how relational databases are built and maintained.

**Public Health and Community Nutrition:** Dietetics practitioners working in public health may be often called upon to respond to outbreaks of food borne illness. The economic and human cost of food borne illness are significant; it has been estimated that 5,000 deaths are the result of food borne illness and that over \$5 billion is spent annually on food borne illness in the United States alone.<sup>61</sup> Nutrition informatics gives RDs and DTRs powerful tools for use in prevention of food borne illness as well as the ability to contain outbreaks when they occur. Dietetics practitioners with skills in user-centered design make it possible to build web-based symptom tracking tools. RD knowledge and skills regarding food borne illness make it possible to gather meaningful data that allow rapid identification of the source and location of food borne illness outbreaks.

Nutrition informatics tools that might be used by public health dietetics practitioners include databases containing genetic footprints of known pathogens, thus making it possible to rapidly determine the cause of outbreaks. Global positioning systems give accurate mapping coordinates

for locations of outbreaks. Using clinical decision support (CDSS) it is possible to develop algorithms that can be used to develop best practices for safe food production. Social networking might be used to rapidly send information to field workers and the public.<sup>62,63</sup>

**Education and Research:** Use of HIT to create databases containing information collected from multiple sources enables researchers to participate in large-scale research projects. Dietetics practitioners conducting research projects that utilize health data must be aware of regulations regarding secondary use of data, including requirements for de-identification, informed consent, and transparency in research design.<sup>64,65</sup>

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