The information age is presenting new tools, opportunities and challenges to nurses in advanced practice. The amount of information available and necessary for APN practice is growing at an unprecedented rate. Published research reports, practice guidelines, and professional web-based resources abound. Fortunately, technology and tools available for locating, organizing, and managing information are also rapidly advancing, promising to enable levels of evidence-based practice and patient safety that would be impossible without computerization. For example, advanced search tools assist APNs in locating pertinent research findings among thousands of reports, and medication references on handheld computing devices are regularly automatically updated, providing APNs convenient access to drug dosing information. Technology is an integral component of contemporary APN practice. In their groundbreaking report on health care quality, the Institute of Medicine (IOM) identified the use of information technology as one of four primary target areas to improve the quality of health care in the U.S. (Institute of Medicine (U.S.). Committee on Quality of Health Care in America., 2001). Therefore, familiarity and competency with technology, particularly computers, is an important skill for APNs.

Nursing informatics refers to the management and use of data and information to support nursing practice and delivery of nursing care (Graves & Corcoran, 1989). Nurses in practice need basic competency in informatics, much as they need to have competency in communication or physical assessment. Although nursing organizations have not yet issued a comprehensive and
conclusive statement about specific informatics competencies for nurses, the National League for Nurses (NLN) (2008) has identified the need to do so.

Working towards developing consensus about nursing informatics competencies, expert panels and nurse informaticists have suggested basic informatics competencies for nurses. For example, a group of nursing informatics experts derived a list of informatics competencies for nurses based on literature review and expert consensus which has since been widely cited (Staggers, Gassert, & Curran, 2001, 2002a, 2002b). The competencies they identified for beginning nurses focus on basic computer skills, familiarity with common applications, use of electronic communications like email, and recognition of privacy and security concerns (Staggers et al., 2002b). Competencies at the expert level are then related to the nurse’s area of expertise, such as the use of staff scheduling applications for those in administration, testing software for nurse educators, or public health databases for nurses in public health practice (Staggers et al., 2002b).

Although the competencies developed by Staggers and colleagues (2002a) have been widely cited and applied, one limitation of this work is that the competencies are not seen as necessary for all nurses; rather, the competencies may or may not be attained depending on the type of practice a particular nurse is engaged in. Curran (2003) reported on work at several universities to develop a list of informatics competencies for nurse practitioners informed by the work of Staggers and colleagues (2002a) but specific to the role of nurse practitioner. These competencies are relatively applicable to all APNs because they focus on broad informatics competencies for advanced practice. The list of competencies for nurse practitioners appears in Table 1.

[insert table 1, obtain permission to use]
Many of the informatics competencies identified for APNs in Table 1 and by other authors as well are related to recognizing information needs and then making efficient use of resources available for locating, managing, and applying information for practice. Bakken (2001) in identifying informatics competencies necessary for evidence-based nursing practice wrote that nurses must be able to retrieve relevant sources of information and critically analyze evidence for applicability to practice. Information and evidence may be drawn from a variety of sources, from electronic patient records to databases of research publications to proprietary consumer health websites. This chapter will review some important informatics resources and tools that may help APNs access and manage these often valuable but potentially overwhelming treasure troves of information.

Informatics advances rapidly. Therefore, the resources described in this chapter should be viewed only as a representative sample of the informatics tools available to APNs, not as an exhaustive list. Because new resources are constantly being developed, the reader is encouraged to use this chapter as a starting point for considering informatics resources for practice. Many mechanisms for staying abreast, such as professional development and APN journals, provide opportunities to learn about and evaluate new informatics innovations as they become available.

Informatics resources for APNs and their clients

Hopefully we are working towards a future in which informatics innovations will interface seamlessly with one another and with APN practice. Evidence and relevant information will be presented whenever and wherever it is needed. Electronic health record systems will receive input from the devices that monitor patients; access databases to collect relevant evidence, literature and guidelines; and output appropriate support for clinical decision making for both provider and patient. The technology ideally becomes so well integrated and ubiquitous
that it is not even noticed, but is incorporated into the everyday practice of the APN. When and if that goal is attained, discussing specific informatics resources and tools as discrete and separate entities will be difficult.

Currently some informatics innovations do interface and overlap; electronic health records and decision support systems are an example. However, many informatics innovations are not seamlessly incorporated into practice, relying instead on the APN to actively engage them to support practice.

*Electronic Health Record Systems*

The ideal electronic health record system is a system in which the computer-based health records of diverse organizations and the health records maintained by lay persons all interface to share information in an optimal manner to support health and health care. The IOM has identified the key functionalities of an electronic health record system as

(1) longitudinal collection of electronic health information for and about persons, where health information is defined as information pertaining to the health of an individual or health care provided to an individual; (2) immediate electronic access to person- and population-level information by authorized, and only authorized, users; (3) provision of knowledge and decision-support that enhance the quality, safety, and efficiency of patient care; and (4) support of efficient processes for health care delivery. Critical building blocks of an EHR system are the electronic health records (EHR) maintained by providers (e.g. hospitals, nursing homes, ambulatory settings) and by individuals (also called personal health records) (Institute of Medicine, 2003, p. 1).

National initiatives are pushing for the adoption of electronic records in all health care setting by 2014 (National League for Nursing, 2008). Although some experts predict adoption will require as much as a decade longer (Ford, Menachemi, & Phillips, 2006), electronic health records are becoming more common. Under the umbrella term electronic health record (EHR) are included both the electronic medical record (EMR) maintained by health care organizations
and the personal health record (PHR) primarily owned and intended for use by consumers (Stead, Kelly, & Kolodner, 2005).

**EMRs.** Electronic medical record (EMR) is currently the preferred term to describe the electronic records used by clinicians in a health care organization. These computerized records partially or fully replace paper-based charts as the repository of information about a client’s care within the organization. EMRs range from records that are essentially computer-based versions of the old paper patient chart to interactive electronic record systems incorporating powerful applications to facilitate evidenced-based practice and support clinical decision making. Consensus is emerging that basic components of an EMR are electronic documentation of clinicians’ notes, the ability to review laboratory and radiology reports, and ordering and prescribing (Jha et al., 2006).

The IOM has identified EMRs and information technology as important tools to adopt in order to improve quality of care and patient safety (Institute of Medicine, 2003; Institute of Medicine (U.S.). Committee on Quality of Health Care in America., 2001). By enabling clinicians at different physical locations to access the complete medical record, and incorporating resources like access to literature databases and support for clinical decision making, EMRs have the potential to improve care, enhance safety, and promote evidence-based practice. EMRs may be especially helpful in the care of patients with chronic diseases because they have the ability to provide all clinicians involved in the individual’s care with access to all relevant clinical information, regardless of where or by whom services were provided.

**Patient Portals.** EMR systems maintained by health care organizations sometimes provide patient portals. These web-based applications enable the consumer to view certain parts of his EMR, and carry out simple tasks including ordering prescription refills, requesting an
appointment, and sending a question to a nurse. Patient portals enable consumers to view parts of their records under certain circumstances. For example, some lab values may be shown to the consumer immediately, primarily those that require little interpretation and are familiar to consumers, such as cholesterol level. Other lab results might be revealed to the patient after review and interpretation by the provider, including thyroid stimulating hormone and hematocrit. Still others might never be available through the web-based application due to privacy concerns, such as an HIV test or genetic screening result. Overall consumer reaction to patient portals has been positive (Hassol et al., 2004; Masys, Baker, Butros, & Cowles, 2002).

**PHRs.** Personal health records (PHRs) are electronic health records maintained and owned by consumers. Although the exact definition of PHR continues to evolve (Halamka, Mandl, & Tang, 2008), PHRs are generally described as repositories for health data contributed by the consumer and providers, and including tools that assist the consumer to take an active role in his health (Tang, Ash, Bates, Overhage, & Sands, 2006). Therefore PHRs may range from simple files containing lists of appointments and prescriptions to powerful and interactive applications helping consumers to control and manage their own health.

Microsoft HealthVault and Google Health are examples of proprietary PHRs now available in Beta versions, indicating that they are available for use but are still undergoing intense development and evaluation. The primary goals of these PHR applications are to provide seamless information sharing to import and export information from providers’ records and personally entered data, and to provide relevant consumer health information.

Google Health is a free consumer tool that enables consumers to enter medical diagnoses and medications, and provides links to related information when available. This basic PHR application enables consumers to import medical records from participating providers including
clinics, hospitals, and pharmacies, and enables consumers to export a Google Health profile to online services that serve as a link to providers who in turn may access that information. Details about Google Health are available online at www.google.com/health, as are instructions on how to sign up for a free Google Health account.

Microsoft HealthVault similarly aims to provide an information link between consumers, providers, insurers, and personal health services, with a goal of enabling consumers to store all of their health information in one place so that it is always organized and available online. HealthVault includes support for uploading information from personal health monitoring devices like heart rate monitors. Microsoft provides a home page for consumers and a separate home page for providers about HealthVault, available at www.healthvault.com.

PHRs are currently the subject of much research and development. Many more PHR products and exciting advances may be expected in the next few years.

**Clinical Decision Support Systems.** A clinical decision support system (CDSS) is a software system typically embedded in an EHR system. The CDSS integrates information about a particular patient with a knowledge base to generate patient-specific evaluations and recommendations to aid the provider or patient in making health-related decisions (Hunt, Haynes, Hanna, & Smith, 1998; Institute of Medicine (U.S.). Committee on Quality of Health Care in America., 2001). The term “patient” in this context may refer to an individual or to a specific population.

The IOM report Crossing the Quality Chasm (Institute of Medicine (U.S.). Committee on Quality of Health Care in America., 2001) summarized the literature on effectiveness of CDSS and concluded that CDSS systems have been demonstrated to improve prevention and monitoring practices. In addition, some evidence exists that CDSS for drug dosing is also
effective. At the time of the report, data about effectiveness of CDSS for drug selection, avoidance of drug interactions, and screening for adverse effects was limited; the development of such systems was limited by the amount and complexity of knowledge involved.

CDSS for diagnosis and management is more complex still, and little data about its effectiveness was available at the time of the IOM report. However, the committee noted that advances in science and technology indicated that CDSS had the potential to grow and to improve the quality of health care.

A number of research reports about CDSS have been published since the IOM report became available, indicating that the IOM committee’s prediction was correct. A review of CDSS in ambulatory primary care settings demonstrated that types and implementations of CDSS in primary care varied greatly, but overall CDSS appeared to have potential to improve outcomes (Bryan & Boren, 2008). Another review found that CDSS to improve prescribing practices for the elderly showed benefits (Yourman, Concato, & Agostini, 2008).

Although less has been published about CDSS specifically for nursing, Lyerla (2008) reported the successful implementation of a nursing CDSS to prevent ventilator-associated pneumonia by using alerts to maintain semirecumbant patient positioning. Bakken (2006) described the potential for nursing CDSS to improve patient safety in such areas as falls prevention, prevention of pressure ulcers, and medication administration, but noted that although process oriented research about nursing decision support exists, there is a need for more outcomes-based research.

Public Health Databases

Rich databases of public health data and statistics are available online. APNs may use these sources of national, state, county, and regional data for a variety of purposes including
detection of problems specific to their population, identification of important targets for health promotion campaigns, and evaluation of disease outbreaks like influenza or arsenic poisoning.

To access these databases, the APN must simply know where to begin. For example, national data related to Healthy People 2010 goals are available at www.healthypeople.gov. The CDC National Center for Health Statistics (available at www.cdc.gov/nchs) provides links to a wealth of national data, such as the annual number of deaths attributed to leading causes of death, and the results of the National Health Care Surveys; as well as related reports and publications which in some cases compile and distill the data into a format that may be easier to use.

State level data are available from the CDC website for some datasets. Additional state databases are made available by state agencies themselves. For example, health statistics related to Healthy People 2010 goals are available from the Wisconsin Department of Health Services on the Wisconsin State Health Plan website (available at http://dhs.wisconsin.gov/statehealthplan). The availability and location of state, county and regional data varies from one location to another; the state government’s website is a reasonable location from which to begin a search. Local public health practitioners and libraries are also valuable resources for locating this data.


The literature available to APNs for practice is growing at an impressive rate. Because nurses cannot possibly be aware of all that is being published, bibliographic databases become more important as the amount of literature grows. PubMed and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) are two important bibliographic databases for APNs, and each has a unique purpose and contribution to APN practice.
PubMed (available to everyone at http://www.ncbi.nlm.nih.gov/pubmed/) is the database of biomedical journal citations and abstracts created by the U.S. National Library of Medicine (NLM). The largest component of PubMed is MEDLINE, which indexes the biomedical literature from 1949 to the present. Resources indexed in PubMed in addition to those included in MEDLINE include citations for articles that are very recently published and not yet included in MEDLINE, and citations for some life sciences journals that are beyond the scope of or not yet included in MEDLINE. PubMed indexing uses Medical Subject Headings (MeSH) terms, and the PubMed website includes a MeSH browser which enables users to locate search terms related to their concept of interest. Literature search features enable one to place limits on searches, including year of publication (useful if, for example, the APN is only interested in articles published in the past 5 years), type of research subjects (many users limit searches to research with humans), and type of article (RCTs, review articles, etc). PubMed also provides links to full-text articles when available. Although performing a good PubMed search can be daunting at first, the PubMed website includes short tutorials and resources helpful for novice users.

CINAHL is owned and operated by EBSCO Publishing and is available through most medical and nursing libraries and many public libraries. This bibliographic database indexes the nursing and allied health literature for the years 1982 to the present, using CINAHL subject headings which were developed to reflect nursing and allied health terminologies. Some full-text articles are available through CINAHL as well. In addition to journal articles, CINAHL includes dissertations, book chapters, nurse practice acts, and AV materials. Although PubMed includes much nursing literature, it does not include much of that which is indexed in CINAHL. CINAHL, on the other hand, indexes most of the nursing literature, but does not include much of
the biomedical literature that might also be important for APNs. An often useful strategy is to perform both a PubMed search and CINAHL search if one database is not clearly more relevant for a particular information need.

Other bibliographic databases may also be very useful in specific circumstances. For example, PsycINFO, a database produced and copyrighted by the American Psychological Association, may produce the most relevant results if the information need is in the domain of psychology. PsycINFO is a database of psychological literature abstracts from the 1800s to present. Or the APN might search the Cochrane Library exclusively if one is a rigorous review of the existing literature about a specific topic is required. The Cochrane Library is a subscription service available through most medical and nursing libraries. In addition, access to the abstracts and summaries when available for all Cochrane systematic reviews are free to everyone at http://www.cochrane.org/reviews.

Tips for searching online bibliographic databases like those described above focus on formulating a question, devising a sound search strategy, and leveraging the features of the bibliographic database search engine. Most include tutorials, tips for use, and instructions online. The reader is encouraged to use these online resources and also to take advantage of classes offered at medical and nursing libraries to improve literature searching skills.

*National Guideline Clearinghouse.*

The National Guideline Clearinghouse (NGC) is an online repository of evidence-based guidelines for clinical practice. Maintained by the Agency for Healthcare Research and Quality (AHRQ), the NGC provides access to guidelines from a variety of authoritative sources, which are vetted and updated regularly. Special features of the website include side-by-side display of guidelines for comparison, annotated bibliographies associated with each guideline, and the
ability to download guidelines to handheld devices (e.g. PDAs). The NGC is freely available to everyone at http://www.guideline.gov/. Users may browse or search for guidelines by disease or condition. Like the bibliographic databases described above, the NGC website includes instructions and tips for searching the database.

Genomics Resources: NCBI, Genetic Home Reference, and More.

As genomics and genetic science progresses, genetic testing and genomic knowledge are becoming important in APN practice. Clients and clinicians alike will have more genetic questions. Excellent resources exist online to help answer these questions. Much of the literature is available through the databases mentioned above, but resources exist to help with specific genetic questions as well.

For example, the Genetic Home Reference is a resource created and maintained by the National Library of Medicine and is freely available to everyone at http://ghr.nlm.nih.gov/. This resource includes information appropriate for consumers that may also be useful to APNs whose specialty is not genetics. Included are basic science content about genes, chromosomes and DNA; information about specific genetic conditions; a glossary of terms associated with genetics; and links to other genetics resources, including resources for the public and resources for providers. APNs may find that beginning a search for genetic information with the Genetic Home Reference then extending the search to other professional resources as needed is a useful strategy.

The U.S. Centers for Disease Control and Prevention (CDC) National Office of Public Health Genomics (http://www.cdc.gov/genomics) maintains a web resource of general information about public health genomics, updates, and links to CDC public health genomics
publications. This resource is another useful source of genetic and genomic information for APNs, as well as links to other resources.

The National Center for Biotechnology Information (NCBI) is the U.S. national resource for molecular biology information. The NCBI makes web resources available at http://www.ncbi.nlm.nih.gov/. The NCBI website provides access to sophisticated genetic resources that some APNs may find useful, though the level may be most appropriate to genetics researchers and practitioners who specialize in genetics. Available resources include software tools for analyzing genomic data, genetic and molecular databases, and education resources. The NCBI is free to everyone, and is serving a vital role in helping genomic researchers to share data and tools and disseminate findings.

_PDAs and Applications._

Efficient time management is the hallmark of a good practitioner. One aspect of efficient time management is having the right information, at the right time, to make the right decision. This concept has been true since the use of the abacus. As people became more mobile, the need for a portable machine that could give them the right information, at the right time, became important. Not surprisingly, the first company to address this need was Apple who developed a personal digital assistant (PDA) in 1993 called the Newton. The product had minimal success but did start a revolution of mobile hand held devices. Other companies developed PDAs but the market remained weak until 1996, when a relatively unknown company called Palm Inc. released its first Palm Pilot PDA. If timing is everything then the timing was right for this product, and the explosion of the hand held PDA was established.

Practitioners have found the clinical benefits of the PDA to be multiple, often referring to them as their “peripheral brain”. The device is easy to use and provides timely access to up-to-
date nursing and medical information. The result is improved patient safety, satisfaction, and quality care. In addition, the portability of the device saves time while reducing medical errors.

A vast library of third-party applications (more than 20,000) have been written for the PDA. Generally the most common applications in use by practitioners fall into the following categories:

- medication reference tools;
- electronic textbooks;
- clinical computational programs;
- clinical decision support software;
- practice guidelines.

We will explore each of these categories beginning with medication reference tools.

Medication reference tools are the most popular application used on the PDA by practitioners. In a study by Rothschild (2002) of electronic drug reference users, 83% of respondents reported being better able to inform patients about medication use. The study further revealed that half of the respondents estimated use of medication reference software had prevented at least one adverse drug event per week. Micromedex is a pharmacy database that includes drug-drug and drug-food interactions. Micromedex is considered one of the most authoritative resource available, is supported by over 150 advanced degree specialists, and is used in over 3200 facilities in the U.S. and Canada. The material is accessible both on the personal computer as well as downloadable to the PalmOS and Pocket PC. An important feature of the product is that it is extremely reliable and accurate.

A second popular medication reference is ePocrates Rx. Similar to Micromedex, ePocrates Rx provides drug information easily and quickly with many of the same features of
Micromedex and is used extensively in private practice. The interface on ePocrates Rx is easy to read, loads faster than Micromedex, and has a pediatric dosage calculator built in. ePocrates Rx is free and has a feature called Doc Alert which alerts physicians’ to new information, but contains advertisements/promotions when displayed. A useful comparison of various drug databases was published by Clausan and colleagues (2004).

Electronic Textbooks such as 5-Minute Clinical Consult are used in the clinical setting for a variety of purposes. The most commonly used content of 5-Minute Clinical Consult is the sign and symptom index, which supports practitioners in the diagnosis, treatment, and follow-up of a patient’s complaint. Over 704 medical conditions are outlined. The screen is easy to read in brief, bulleted points organized by disease topics. Quarterly content updates are available online. In addition, the software has the ICS-9-CM code index, facilitating classifying and coding diseases.

Calculations of any kind are hard to remember and time consuming to do on paper. The PDA can store and do calculations in moments. MedCalc is the most common software used for this purpose on the PDA. MedCalc provides over 80 unique calculation formulas. Included are calculators for IV flow rate, BMI, Glasgow comma scale, fluid replacement after burns, pregnancy calculation and red blood indices. MedCalc is free, another advantage to this software.

Clinical decision support systems (CDSS) as described above related to EHRs are also making their way into PDA applications. Because of previous limitation on memory size in PDAs it was difficult to place many of the computer based support systems into a handheld. However, with new technology and increases in storage capacity more of these expert systems are available. An example is BiliTool (http://bilitool.evidencebasedcare.org/). In the past, one needed to manually plot an infant’s age on a Bhutani nomogram, introducing the possibility for
human error. The BiliTool facilitates hyperbilirubinemia risk stratification in newborns by doing this calculation automatically, using expert information and decreasing human error.

Many of the programs mentioned above have practice guidelines incorporated. However, some specific practice guideline resources which can be loaded onto a handheld device are important to highlight. One site is Shots http://www.immunizationed.org/. This site is a necessity for any practitioner who is involved in giving immunizations. The reference guide is a collaboration of the Academy of Pediatrics, the Advisory Committee on Immunization Practices, and the American Academy of family Practice. The site gives schedule information for not only first time immunizations but for those difficult to remember schedules for patients who are off schedule. The American Heart Association in collaboration with the American College of Cardiology has numerous practice guidelines available. For example, pocket guidelines are available for the management of chronic heart failure in the adult, and for the management of patients with atrial fibrillation (www.apprisor.com). The Center for Disease Control (CDC) also has practice guidelines for a variety of diseases such as Tuberculosis and HIV (http://www.openclinical.org/appPDA_CDC_TB.html). The National Heart, Lung and Blood institute provides a download from their website on asthma treatment guidelines (http://hp2010.nhlbihin.net/as_palm.htm). They also provide a helpful cholesterol management implantation tool downloadable from their web site (http://hp2010.nhlbihin.net/atpiii/atp3palm.htm).

The acceptance of the PDA as an important part of medicine is widespread. With rapidly changing information, patient safety issues, and time pressures these devices are another arsenal in a practitioner’s toolbox. However, the future of the PDA is unclear in light of the newer smart phones. Many of the applications mentioned above are now available on the Iphone
and Blackberry. The lines between specific types of technology may blur and overlap, but the advantages of handheld information for APN practice are obvious regardless of device.

_Telehealth._

Connecting with people at a distance is not a new phenomenon. Ancient populations used smoke signals. Two way radios were used in remote villages. Alexander Graham Bell’s famous invention increased the population’s ability to connect at a distance. In health care, providers have been using the telephone since its invention as a way to connect with patients. In the 1960’s, a new facet was added to the use of communication in health care when NASA monitored the physiologic parameters of astronauts in space. Physiologic parameters were measured and clinical decision making was instituted based on the results of monitoring. The space program demonstrated the first real application of telemedicine. After a slight decline in the early 1980’s, the use of telemedicine tools has risen steadily. Increases in broadband access and transmission quality, declines in costs of transmission and tools, and improvements in reimbursement have led to this increase in use.

Telemedicine may be divided into three types: _real time, store and forward_ (asynchronous), and _home health monitoring_. Real time telemedicine uses live video between providers and a patient most often for specialty consultations. The technology brings the expert to the patient/provider, eliminating distance as a factor and enabling specialist care for the patient. Psychiatry and cardiology are examples of specialty consultations routinely done by telemedicine. In addition, many hospitals are using telemedicine in ER’s and ICU’s for direct access to specialist care. One example is in California where rural ER’s are connected to medical center pediatric specialists for assistance in providing care for emergencies and injured children (Marcin et al., 2004).
Store and forward telemedicine is used for consultations in which simultaneous participation of both health care providers is not needed. Radiology is a good example of this kind of telemedicine and is currently the most common telemedicine specialty practice. Radiographs are digitized, transmitted, and read at a distance. The practice is often used at night when a radiologist is not on site, or in large departments that use outside specialty radiologists (Thrall, 2007). Other store and forward telemedicine specialties are Tele-ophthalmology and dermatology.

The third common type of telemedicine is home health monitoring. Home health monitoring allows remote observation of patient status using technology. The Veterans Administration (VA) has been using telemedicine successfully for home health monitoring for many years. The VA has demonstrated the value of telemonitoring using a Health Hero System (https://www.healthhero.com) in the home. In this system, patients are instructed in a variety of devices that connect to the Hero System to monitor their health condition. For example, the system has a scale that the patient stands on which automatically transmits their weight through a phone line to a central server, which is then accessible by a nurse who monitors a case load of patients. The advantage of the system is that the nurse monitors the patient daily, allowing the nurse to recognize a subtle change in the patient’s condition from the data that is uploaded. The nurse can then contact the patient and other health care providers as needed. The VA has found the monitoring process very effective in decreasing hospital days and clinic visits (Chumbler et al., 2005). Telemonitoring equipment available for use in the home includes scales, blood pressure monitors, pulse oximeters, glucose monitoring equipment, EKG monitoring equipment, and peak flow meters, all used to monitor patients from a distance.
Where telemedicine is the monitoring of patients at a distance to impact clinical decision making, telehealth is a broader concept. Health Resources Services Administration (HRSA) has defined telehealth as “the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration” (http://www.hrsa.gov/telehealth). Generally telehealth tools include online medical knowledge sources for health professionals, decision support tools, and online and video-based education. For example, practitioners may log on to the internet and obtain medical information as needed (http://www.ebmny.org/cpg.html). Webcasts, online CME’s, grand rounds and distance education are available through portals such as Medscape (http://www.medscape.com/home).

Medline Plus.

A favorite of beginning nursing students, Medline Plus is the consumer health site of the NLM. Freely available to everyone at http://medlineplus.gov/, Medline Plus is the first choice for patient education about a wide variety of health topics. Vetted and maintained by the NLM, Medline Plus is useful as a first line reference for APNs about topics outside their area of expertise as well. Included is information about specific diseases and conditions, wellness topics, and medications and supplements, as well as a dictionary of medical terms and medical encyclopedia. Directories for finding providers and other resources such as libraries, health organizations and services are also included.

Consumer Health Applications and Websites: WebMD, 23&me, and More.

Health-related websites for consumers vary in scope, accuracy, and purpose. Some websites have a primary goal of selling products that may or may not have been properly evaluated for safety and efficacy, while others offer predominantly unbiased health information,
generally financed by space devoted to advertisement on the website. Consumer websites may enable users to connect with a community of people who share a common concern or struggle. For example, eDiets and Weight Watchers offer an online community and support as well as weight management and activity tools, information, and resources that some consumers may find valuable.

Not-for-profit consumer websites in addition to Medline Plus mentioned above also exist. For example, the U.S. Department of Agriculture (USDA) created and maintains MyPyramid.gov (available at [http://www.mypyramid.gov](http://www.mypyramid.gov)), a website that in addition to offering information on nutrition enables the consumer to track food and caloric intake and activity. My Family Health Portrait ([https://familyhistory.hhs.gov/](https://familyhistory.hhs.gov/)) is an online tool created by the Office of the U.S. Surgeon General which enables consumers to enter their family health history information and obtain a printout to review with their health care providers. The tool does not offer any interpretation or decision support but does provide tools for maintaining a record of family health history and printing both a chart and a pedigree.

Some consumer websites are proprietary but reasonably well regulated. Pharmaceutical websites for consumers fall into this category, and are a type of direct-to-consumer marketing for medications. Other commercial websites offer testing services, like 23andMe ([https://www.23andme.com/](https://www.23andme.com/)), which enables the consumer to obtain genomic testing. The impact and value of such consumer-driven testing have not been established.

Consumers have varying degrees of discrimination in using web-based health resources. Some consumers believe nearly everything they find online, some believe none of it, and most fall somewhere in between. APNs can serve a valuable role in helping their patients navigate the World Wide Web health resources. By recommending reputable websites, APNs can steer
patients to trustable resources like Medline Plus, either as a primary source of information or as an alternative to a less trustworthy site.

In evaluating health information online, an important step is to determine who runs the website. Sites run by trusted entities like universities, government agencies (e.g. the USDA), health care systems, or established health organizations (e.g. the American Cancer Society) are most likely trustworthy. APNs and consumers should be wary of websites run by commercial enterprises, bearing in mind that the primary objective may be to make a profit rather than to support consumer health.

Consumers often bring information which they have discovered online to their providers. A useful strategy for APNs in this situation is to discuss the information while avoiding defensiveness. APNs can educate their patients about evaluating web resources. The National Library of Medicine offers several resources regarding evaluation of the quality of health information on the Internet. Through MedlinePlus, APNs and consumers can access a short tutorial on evaluating health websites (available at http://www.nlm.nih.gov/medlineplus/webeval), and a “Guide to Healthy Web Surfing” with easy-to-understand tips for evaluating health information online (http://www.nlm.nih.gov/medlineplus/healthywebsurfing.html or by search from the homepage).

The Health on the Net Foundation (HON) is a non-governmental organization committed to ensuring quality health information online. This foundation certifies trusted health related websites and provides a certification to those that meet its criteria for quality. Certified websites post HONcode certification symbol, and the foundation uses sophisticated web surveillance to ensure that all sites using their certification have actually been certified. It is important to stress
that the absence of HONcode certification does not mean that a website is not of good quality, because certification is by request.

**Conclusion**

Informatics resources and tools are available to help nurses and consumers locate and manage information, support decision making, and improve safety. Recognizing the need for information and knowing about resources that can help to provide relevant information are vital skills for APNs. By keeping abreast, APNs will be able to benefit from the latest and greatest informatics tools, resources, and innovations.

**References**


Table 1. APN informatics competencies (Curran, 2003). [Need permission to reprint]

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<tr>
<th>Computer skills</th>
<th>Informatics Knowledge</th>
<th>Informatics Skills</th>
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<tr>
<td>• Accesses shared data sets*</td>
<td>• Supports efforts toward development and use of structured languages*</td>
<td>• Converts information needs into answerable questions</td>
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<tr>
<td>• Extracts data from clinical data sets*</td>
<td>• Promotes the integrity of nursing information and access necessary for patient care within an integrated computer-based patient record*</td>
<td>• Uses data and statistical analyses to describe and evaluate practice</td>
</tr>
<tr>
<td>• Extracts selected literature resources and integrates them to a personally usable file*</td>
<td>• Evaluates computer-assisted instruction (CAI) as a teaching tool*</td>
<td>• Evaluates health information on the Internet using a structured critique format</td>
</tr>
<tr>
<td>• Uses applications to aggregate and analyze data for forecasting, accreditation, clinical value, nurse-sensitive outcomes, evidence-based practice, and quality improvement</td>
<td>• Provides for efficient data collection*</td>
<td>• Assists patients to use databases to make informed decisions*</td>
</tr>
<tr>
<td>• Uses applications to format and present data and information</td>
<td>• Discusses the impact of computerized information management on the role of the nurse*</td>
<td>• Acts as an advocate of system users including patients and colleagues*</td>
</tr>
<tr>
<td>• Uses decision support systems, expert systems, and aids for differential diagnosis</td>
<td>• Describes ways to protect data*</td>
<td>• Performs basic trouble-shooting in applications*</td>
</tr>
<tr>
<td>• Uses interactive communication devices with patients and other healthcare providers</td>
<td>• Discusses general applications, systems to support clinical care*</td>
<td>• Incorporates structured languages into practice</td>
</tr>
<tr>
<td></td>
<td>• Evaluates computer-assisted instruction (CAI) as a teaching tool*</td>
<td>• Applies the principles of data integrity, professional ethics and legal requirements for patient confidentiality and data security</td>
</tr>
<tr>
<td></td>
<td>• Provides for efficient data collection*</td>
<td>• Designs and uses database reports</td>
</tr>
<tr>
<td></td>
<td>• Discusses the impact of computerized information management on the role of the nurse*</td>
<td>• Demonstrates knowledge and clinical decision making processes within site specific practice</td>
</tr>
<tr>
<td></td>
<td>• Describes ways to protect data*</td>
<td>• Evaluate the appropriateness of the monitoring system for the type of data needed</td>
</tr>
<tr>
<td></td>
<td>• Describes general applications, systems to support clinical care*</td>
<td>• Converts data into information and then knowledge</td>
</tr>
</tbody>
</table>
| | • Evaluates computer-assisted instruction (CAI) as a teaching tool* | *

*Competency from the research-based work of Staggers el al (Staggers et al., 2002a)