NACNEP

National Advisory Council on Nurse Education and Practice

Challenges Facing the Nurse Workforce in a Changing Environment

Part I: Surge Capacity: Educating the Nursing Workforce for Emergency and Disaster Preparedness

Part II: Information Techology in Nursing Education and Practice

Seventh Annual Report

To the Secretary of the U.S. Department of Health and Human Services and the U.S. Congress

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The National Advisory Council on Nurse Education and Practice (NACNEP) advises the Secretary of the U.S. Department of Health and Human Services and the U.S. Congress on policy issues related to programs authorized by Title VIII of the U.S. Public Health Service Act and administered by the Health Resources and Services Administration (HRSA), Bureau of Health Professions (BHPr), Division of Nursing (DN), including nurse workforce supply, education, and practice improvement.

Charter of National Advisory Council on Nurse Education and Practice

Purpose

The Secretary and, by delegation, the Administrator of the Health Resources and Services Administration (HRSA), are charged under Title VIII of the Public Health Service Act, as amended, with responsibility for a wide range of activities in support of nursing education and practice which include: enhancement of the composition of the nursing workforce, improvement of the distribution and utilization of nurses to meet the health needs of the Nation, expansion of the knowledge, skills, and capabilities of nurses to enhance the quality of nursing practice, development and dissemination of improved models of organization, financing and delivery of nursing services, and promotion of interdisciplinary approaches to the delivery of health services particularly in the context of public health and primary care.

Authority

42 United States Code (USC) 297t; Section 845 of the Public Health Service Act, as amended. The Council is governed by provisions of Public Law 92-463, which sets forth standards for the formation and use of advisory committees.

Function

The Advisory Council advises and makes recommendations to the Secretary and Congress on policy matters arising in the administration of Title VIII including the range of issues relating to the nurse workforce, nursing education, and nursing practice improvement. The Advisory Council may make specific recommendations to the Secretary and Congress regarding programs administered by the Division of Nursing particularly within the context of the enabling legislation and the Division's mission and strategic directions, as a means of enhancing the health of the public through the development of the nursing workforce.

Additionally, the Advisory Council provides advice to the Secretary and Congress in preparation of general regulations and with respect to policy matters arising in the administration of this title including the range of issues relating to nurse supply, education, and practice improvement.

Structure

The Advisory Council shall consist of the Secretary or delegate who shall be an ex officio member and shall serve as the Chairperson, and not less than twenty-one (21), nor more than twenty-three (23) members selected by the Secretary. Two of the appointed members shall be selected from full-time students representing various levels of education in schools of nursing; two shall be selected from the general public; two shall be selected from practicing professional nurses; and nine shall be selected from among the leading authorities in the various fields of nursing, higher, secondary education and associate degree schools of nursing, and from representatives of advanced education nursing groups (such as

nurse practitioners, nurse midwives, and nurse anesthetists), hospitals and other institutions and organizations which provide nursing services. The Secretary shall ensure a fair balance between the nursing profession, with a broad geographic representation of members, a balance between urban and rural members, and the adequate representation of minorities. The majority of members shall be nurses.

The Secretary shall appoint members to serve for overlapping 4-year terms. Members will be appointed based on their competence, interest, and knowledge of the mission of the nursing profession. Members appointed to fill vacancies occurring prior to the expiration of the term for which their predecessors were appointed shall be appointed only for the remainder of such terms. A student member may continue to serve the remainder of a 4-year term following completion of a nurse education program.

Subcommittees composed of members of the parent Advisory Council shall be established to perform specific functions within the Advisory Council's jurisdiction. The Department Committee Management Officer will be notified upon establishment of each of the subcommittees and will be provided information on its name, membership, function, and established frequency of meetings.

Management and support services shall be provided by the Division of Nursing, Bureau of Health Professions, Health Resources and Services Administration.

Meetings

Meetings shall be held at least two times a year at the call of the Designated Federal Officer or designee who shall approve the agenda and shall be present at all meetings. Meetings shall be held jointly with related entities established under this title where appropriate including the Council on Graduate Medical Education; Advisory Committee on Interdisciplinary,
Community-Based Linkages; and the Advisory Committee on Training in Primary Care Medicine and Dentistry.

Not later than 14 days prior to the convening of a meeting, the Advisory Council shall prepare and make available an agenda of the matters to be considered by the Advisory Council at such meeting. At any such meeting, the Advisory Council shall distribute materials with respect to the issues to be addressed at the meeting. No later than 30 days after the adjournment of this meeting, the Advisory Council shall prepare and make available to the public a summary of the meeting and any actions taken by the Advisory Council based upon the meeting.

Meetings shall be open to the public except as determined otherwise by the Secretary or other official to whom the authority has been delegated in accordance with the Government in the Sunshine Act (5 USC 552b(c)). Notice of meetings shall be given to the public. Meetings shall be conducted, and records of the proceedings kept as required by applicable laws and Departmental regulations.

Compensation

Members who are not full-time Federal employees shall be compensated at a rate equal to the daily equivalent of the annual rate of basic pay prescribed for Level IV of the Executive Schedule under

section 5315 of title 5, United States Code, for each day (including travel time) during which such member is engaged in the performance of the duties of the Advisory Council.
Members shall be allowed travel expenses, including per diem in lieu of subsistence, at rates authorized for employees of agencies under subchapter I of chapter 57 of Title 5, USC, while away from their homes or regular places of business in the performance of services for the Advisory Council. Any such travel shall be approved by a Federal Government official in accordance with Standard Government Travel Regulations.

Annual Cost Estimates

Estimated annual costs for operating the Advisory Council, including compensation and travel expenses for members but excluding staff support, is $232,436. Estimate of staff-years of support required is 2.5 at an estimated annual cost of $323,368.

Reports

The Advisory Council shall annually prepare and submit to the Secretary, the Committee on Health, Education, Labor, and Pensions of the Senate and the Committee on Energy and Commerce of the House of Representatives, a report describing the activities of the Advisory Council including its findings and recommendations.

In the event a portion of a meeting is closed to the public, a report shall be prepared which shall contain at a minimum a list of members and their business addresses, the Advisory Council's functions, dates and places of meetings, and a summary of Advisory Council activities and recommendations made during the fiscal year. A copy of the report shall be provided to the Department Committee Management Officer.

Termination Date

The duration of the National Advisory Council on Nurse Education and Practice is continuing. Unless renewed by appropriate action prior to its expiration, the National Advisory Council on Nurse Education and Practice will terminate on November 30, 2008.

Topic 1 – Surge Capacity: Educating the Nursing Workforce for Emergency and Disaster Preparedness

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Abstract

A large-scale public health emergency could occur in the wake of a terrorist act or a natural disaster like Hurricane Katrina. To meet the surge of increased demand for healthcare services, the healthcare system must be able to expand rapidly beyond normal capacity. Delivering effective healthcare responses to populations affected by such a disaster requires a prepared and integrated healthcare workforce. Because nurses are the largest group of professionals within the healthcare workforce, they are critical to the effective delivery of all healthcare and public health services. The effectiveness of the healthcare system's response to a public health emergency or disaster is largely dependent on the surge capacity of the nurse workforce.

Meeting the needs for nurses during public health emergencies would be challenging today because of existing nurse shortages, and would be more difficult in the future, when significantly greater shortages are predicted. Large scale disasters, such as Hurricane Katrina, have provided opportunities for learning about deployment and involvement of the nursing workforce. Lessons learned from these events and research show that preparing for mass casualty events must include consideration of a broad range of planning, educational, and technological challenges. The National Advisory Council on Nurse Education and Practice (NACNEP) reviewed these challenges at its 115th meeting in December 2006 and developed a set of recommendations that are put forward in this report.

Executive Summary

A large-scale public health emergency could occur in the wake of a terrorist act or a natural disaster like Hurricane Katrina. To meet the surge of increased demand for healthcare services, the healthcare system must be able to expand rapidly beyond normal capacity. Delivering effective healthcare responses to populations affected by such a disaster (also called a mass casualty event or surge event) requires a prepared and integrated healthcare workforce. Because nurses are the largest group of professionals within the healthcare workforce, they are critical to the effective delivery of all healthcare and public health services. The effectiveness of the healthcare system's response to a public health emergency or disaster is largely dependent on the surge capacity of the nurse workforce.

The United States is currently experiencing a shortage of nurses, as the supply of registered nurses (RNs) is not keeping up with demand. Meeting the needs for nurses during large scale public health emergencies would be challenging today because of existing nurse shortages, and would be more difficult in the future, when even greater shortages are predicted. According to projections from the Health Resources and Services Administration, Bureau of Health Professions (2002), by 2020, demand for nurses may outstrip supply by more than 800,000 nurses, nearly a 30 percent shortage. Enhanced capacity to respond to public health emergencies will require proper response planning at the national, state, and local levels; a sufficiently large nursing workforce with appropriate skill sets; and infrastructure and technology to assist the nursing workforce in executing response plans as part of an integrated healthcare team.

Natural disasters such as Hurricanes Katrina and Rita have provided opportunities for learning about deployment and involvement of the nursing workforce in a surge emergency. These incidents and research underscore the fact that the healthcare system is not currently adequately prepared in the event of another disaster, natural or manmade. Findings from one study showed that very few practicing nurses have any practical experience in emergency or disaster situations (Maddox, 2006).

Preparing for an effective response to surge events must include consideration of a broad range of planning, educational, and technological challenges. These challenges are outlined below.

Table 1: Key Nursing Surge Response Challenges

Challenge	Key Issues
Planning for the Role of the Nursing Workforce	• Planning for the roles of nurses • Coordination of Federal, state, and local agencies • Coordination of volunteers
Preparation Through Nursing Education	• Curricula in nursing schools • Training for supplemental nurse workforce
Use of Technology in Surge Emergencies	• Advanced registration of volunteers and licensing options • Bio-surveillance • Maintaining patient medical records

Planning for the Role of the Nursing Workforce: Planning challenges include determining the roles of different components of the nursing workforce; establishing the roles of nurses in hospitals; and preparing for the roles of relevant agencies in the Federal, state, and local governments. Services must be coordinated among Federal, state, and local government agencies and private entities; lines of authority, supervision, and licensing issues must be clarified and communicated. Response plans must take into account issues such as how to organize and implement mobile clinics rapidly, how to use untrained volunteer labor, and how to meet the personal needs of healthcare providers. In a comprehensive report produced by the Agency for Healthcare Research and Quality (AHRQ) titled "Providing Mass Medical Care with Scarce Resources: A Community Planning Guide" (Phillips & Knebel, 2006), the authors found there was no single oversight agency to ensure consistency in training and certification or guidelines for disaster response, protective equipment, or coordination of operations.

Preparation Through Nursing Education: In order for nurses to be well prepared for disaster response, not only must guidelines and recommendations be in place, but nurses must also be properly trained to recognize and respond to emergency events. While not all nurses will be first responders, all nurses should have the basic knowledge and ability to respond appropriately to Mass Casualty Incidents (MCIs). Research findings indicate that many healthcare practitioners lack confidence in their abilities to provide healthcare in a hypothetical chemical terrorism situation (Rose & Larrimore, 2002). Research findings further indicate the need for the development, implementation, and evaluation of innovative domestic terrorism preparedness programs for nursing continuing education and staff development programs (Maddox, 2006). To support these efforts, more funding is needed to develop and implement continuing education on nursing care during surge emergencies.

> **"Surge capacity**: The ability of a healthcare system to rapidly expand beyond normal services to meet the increased demand for medical care and public health services that would be required to care for patients in the event of a large-scale public health emergency or disaster."
>
> (Trinité, Phillips, Burstin, & Miller, 2006, slide 7)

Curricula that incorporate bioterrorism preparedness and emergency response material are key to enabling nursing graduates to gain occupational competencies related to emergency response. Until recently, however, there has been insufficient focus on developing this type of curricula. Several organizations including the American Association of Colleges and Nursing (AACN), the Joint Commission on Accreditation of Healthcare Organizations and many state health departments have called for the establishment of education related to disaster response.

In addition, given the current overall nursing shortage, it will likely be necessary to identify and educate a supplemental workforce (e.g., retired nurses, inactive nurses, faculty in schools of nursing, other healthcare professionals who can be cross trained) to provide nursing care during surge emergencies. Volunteer databases must be accurate, compatible with each other, and accessible through a variety of systems and devices in order to be most efficient and useable in an emergency. Inactive nurses and volunteers are difficult to contact and prepare with disaster readiness training on a regular basis. For these nurses, just-in-time training and assessment of clinical competencies may be needed before they can be integrated into emergency response situations.

Technological Challenges: Integrating Healthcare Information Technology

As the nation prepares for future emergencies and disasters, communications and information technologies are needed to support an emergency-ready healthcare infrastructure. In order for nurses to respond most effectively to public health emergencies, nurses must be trained in new information technologies that will enable them to serve the public in an effective manner.

Important uses of healthcare information technology (IT) with respect to disaster response include advanced registration of volunteers, establishing and maintaining a database of health professionals, bio-surveillance, monitoring hospital bed availability, tracking patients, and maintaining patient medical records. This technology can improve preparedness and management of resources in the event of a disaster. It is critical that the Federal government and the private sector work together to establish policies and infrastructure to make effective healthcare IT available to nurses and other healthcare providers for use in the event of a disaster.

Caring for Special Populations

In addition to the broad challenges described above, there are unique challenges associated with special populations. While all populations are vulnerable during a major disaster, some populations are especially at risk because they have limited access to healthcare or special needs that must be addressed even in the best of times. These needs may be greatly exacerbated during a major crisis. These populations include infants and children, pregnant women, elderly individuals, people who are impoverished, those with limited English language skills, people with chronic health conditions, and those with disabilities or who are otherwise medically fragile. These groups can represent 20 percent or more of the total population (Cameron, 2006). Planning for surge events must take into account how to overcome barriers to care for these populations.

Recommendations

In this report, the National Advisory Council on Nurse Education and Practice (NACNEP) puts forward a set of recommendations to address the above challenges. The specific recommendations are provided below:

1. State Boards of Nursing should support initiatives to develop or modify existing plans in regard to national nursing standards of care for triage and ongoing patient management during surge events. In times of emergency, it may be desirable for Boards of Nursing to have flexibility in granting temporary certification or licenses for nurses who are inactive, retired, or licensed in another state. It also may be desirable on a temporary and emergency basis to grant permission to certain professionals to function outside their legal scope of practice, such as allowing nurses to diagnose patients and write medical orders. National nursing standards of care must address clinical, legal, and ethical issues that nurses may encounter in large-scale emergencies and encourage the appropriate use of interdisciplinary teams and collaboration.

The Department of Health and Human Services (DHHS) should:

2. Work with the Department of Homeland Security (DHS), states, and nursing organizations to build surge emergency planning into existing practice at national, state, local, and facility levels. Planning should address nursing-specific issues related to movement of nurses across states, mode of response (volunteer vs. registry), licensing, credentialing, communication, security issues to ensure the protection of nurses from any unlawful behavior of the public, and the needs of special populations (e.g., people with disabilities, elderly individuals, rural populations).

3. Support existing recruitment and retention programs to increase the capacity of nursing education and increase nurse supply so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the public health emergency. Given the current nursing shortage and prospects for the shortage worsening, it is essential that surge-related initiatives do not dilute or remove focus from existing recruitment and retention initiatives.

4. Support an initiative to encourage nurses to promote the development of individual/family disaster plans and educate the public about how to handle medical emergencies in a crisis. It is important for all public health workers who would be called upon in an emergency to have plans in place for their own families so they can provide help to the public.

5. Support initiatives to help ensure that nursing-related workforce information systems, such as volunteer databases, are accurate, compatible, and accessible through a variety of systems and devices. Information systems and databases must be up-to-date, interoperable, and accessible via multiple methods in order to be most efficient and useable in an emergency.

6. Provide funding for an independent evaluation of programs that are intended to improve nurse preparation for public health emergencies. This evaluation should assess which programs work best and why, and then disseminate findings from the evaluations.

7. Support initiatives to integrate public health emergency or disaster care-related coursework into curricula for nursing programs. Initiatives should address faculty development and encourage accrediting organizations to consider including emergency preparedness concepts in their standards.

8. Provide funding to support the development and implementation of continuing education on nursing care during public health emergencies. Continuing education should be designed for nurses and educators, include Web-based training, and be applicable to practicing nurses as well as those not active in the clinical workforce.

9. Identify and train a supplemental workforce (e.g., retired nurses, inactive nurses, faculty in schools of nursing, other healthcare professionals who can be cross-trained) to provide healthcare during surge emergencies. With the current nursing shortage, meeting surge capacity needs would be especially difficult without additional labor provided by a supplemental workforce.

10. The United States Congress should commission a study to identify nursing-related lessons learned from surge events like Hurricane Katrina. While the experiences and accounts of nurses who have provided services in recent disasters has been helpful, a formal study is needed to identify the lessons that have been learned. Such a study would provide an effective way to gather those lessons and disseminate them to a broader audience and thereby improve the response of the healthcare system in the event of a mass casualty event in the future.

1. Introduction

In the event of a large scale public health emergency, as occurred in the wake of Hurricane Katrina, the healthcare system must rapidly expand beyond normal capacity to meet increased demand for healthcare services. Delivering effective healthcare responses to populations affected by such a disaster (also called a mass casualty event [MCE] or surge event) requires a prepared and integrated healthcare workforce. Because nurses are the largest group of professionals within the healthcare workforce, they are critical to the effective delivery of all healthcare and public health services. The effectiveness of the healthcare system's response to a public health emergency or disaster is largely dependent on the surge capacity of the nurse workforce.

The United States is currently experiencing a shortage of nurses, as the supply of registered nurses (RNs) is not keeping up with demand. Meeting the needs for nurse surge capacity would be challenging today because of existing nurse shortages, and would be more difficult in the future, when even greater shortages are predicted. According to projections from the Health Resources and Services Administration, Bureau of Health Professions (2002), by 2020, demand of nurses may outstrip supply by more than 800,000 nurses, nearly a 30 percent shortage.

> **"Surge capacity**: The ability of a healthcare system to rapidly expand beyond normal services to meet the increased demand for medical care and public health services that would be required to care for patients in the event of a large-scale public health emergency or disaster."
>
> (Trinité, Phillips, Burstin, & Miller, 2006, slide 7)

Natural disasters such as Hurricanes Katrina and Rita have provided opportunities for learning about deployment and involvement of the nursing workforce in a surge emergency. These incidents and research findings underscore the fact that the healthcare system is not currently adequately prepared in the event of another disaster, natural or manmade. Findings from one study showed that very few practicing nurses had any experience in disaster situations (Maddox, 2006).

Preparing for effective response to surge events must include consideration of a broad range of planning, educational, and technological challenges. These challenges are outlined below.

Table 2: Key Nursing Challenges During Surge Response

Challenge	Key Issues
Planning for the Role of the Nursing Workforce	• Planning for the roles of nurses and volunteers • Coordination of Federal, state, and local agencies
Preparation Through Nursing Education	• Curricula in nursing schools • Training for supplemental nurse workforce
Use of Technology in Surge Emergencies	• Advanced registration of volunteers and licensing options • Bio-surveillance • Maintaining patient medical records

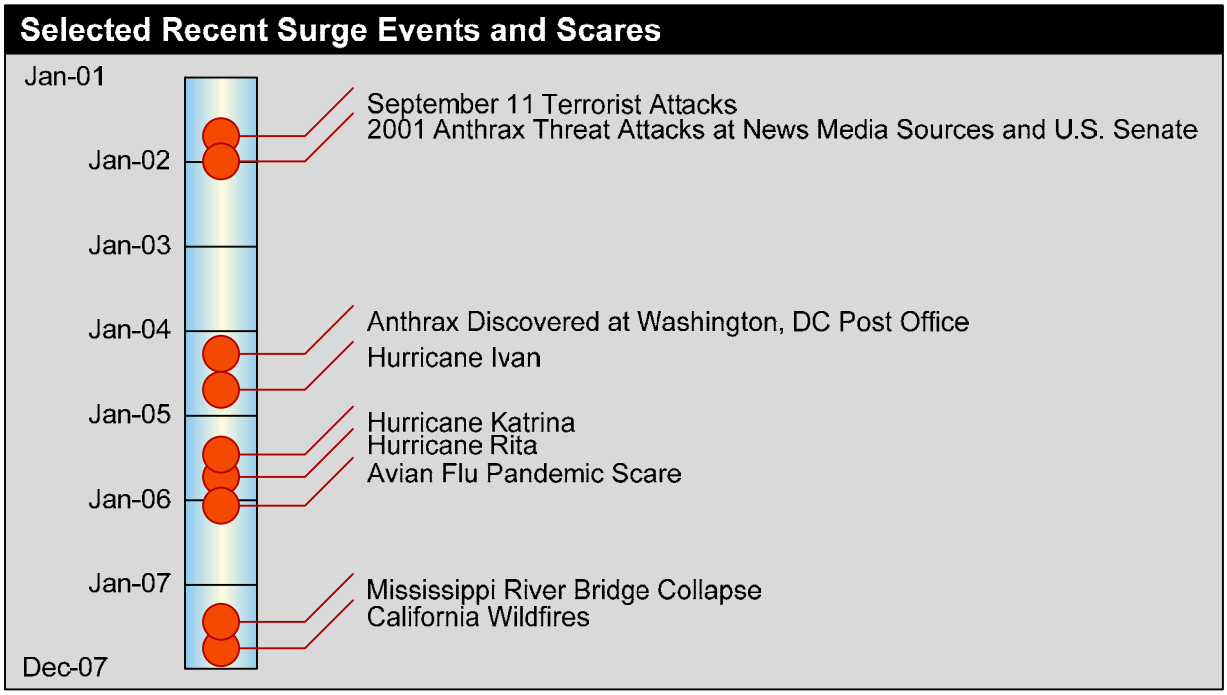
In addition, when planning for disaster response, it is important to examine the unique circumstances of special populations (e.g., infants and children, pregnant women, patients with disabilities). While all populations are vulnerable during a major disaster, these populations are particularly at risk.

2. Planning for the Role of the Nursing Workforce

2.1. The Role of Nurses in Recent Surge Events and Disasters

Natural disasters such as Hurricanes Katrina and Rita have provided opportunities for learning about deployment and involvement of the nursing workforce in a surge emergency. Those disasters raised patient care issues that underscored the importance of nursing's role in surge emergencies including how to provide an emergency patient record, ways to organize and implement mobile clinics, systems needed to access provider credentials, use of untrained volunteer labor, the necessity of recognizing the requirements of special needs populations, and managing the personal needs of healthcare providers. The experiences of those who were involved in the disasters can provide insights about the optimum role of the nursing workforce in surge emergencies.

Figure 1: Selected Recent Surge Events and Scares



During the 2001 anthrax threat, public health nurses in New York City, Washington, DC, and Florida were involved in conducting screenings at clinics to assess anthrax exposure. They provided health risk assessments to identify persons at risk of exposure to anthrax, assisted in detecting possible sources of the outbreaks, and provided prophylactic treatment when indicated. During recent hurricane seasons, public health nurses responded by assessing community health, acting as discharge planners, working with environmental teams, and running special needs shelters (Association of State and Territorial Directors of Nursing, 2002).

After the 1995 Oklahoma City bombing, public health nurses responded immediately by assisting with the triage of the victims and rescue workers. They made certain that volunteers were qualified to assist in areas of emergency care and assisted in directing volunteer services to appropriate areas. These

public health nurses also assessed the health risk exposures of emergency responders to mental health stress, air quality, and other disaster-related stresses.

In surge emergencies leading to compromised circumstances, such as scarce supplies, lack of equipment, damaged infrastructure, or insufficient numbers of available healthcare providers, there may be reasons to temporarily adopt different standards of care than what would apply in situations without such limitations. In preparation for such situations, it is important to establish clear lines of authority for activating altered standards of care. For example, although it is important to ensure that providers are qualified, it may be desirable for Boards of Nursing to have flexibility in granting temporary certification or licenses for nurses who are inactive, retired, or licensed in another state. It may be desirable on a temporary and emergency basis to grant permission to allow certain professionals to function outside their legal scope of practice, such as allowing nurses to diagnose and write medical orders.

From these experiences, it has become clear that guidelines must be established for triage and alternate standards of care during mass casualty events. Before a surge emergency arises, it is important to determine who is authorized to provide care in an emergency situation and under what legal statutory authority the nurse can practice.

The National Advisory Council on Nurse Education and Practice recommends supporting initiatives to develop national nursing standards of care for triage and ongoing patient management. Such standards should address the range of clinical, legal, and ethical issues that nurses may encounter in large-scale emergencies, and encourage the appropriate use of interdisciplinary teams and collaboration. In addition, while the experiences and accounts of nurses who have provided services in recent disasters has been helpful, a formal study is needed to identify the lessons that have been learned. Such a study would provide an effective way to gather those lessons and disseminate them to a broader audience and thereby improve the response of the healthcare system in the event of a MCE in the future.

Case Study: Hurricane Katrina

In November 2005, after Hurricane Katrina struck, faculty and students from Southern University at Baton Rouge, Louisiana State University Medical School, and Tulane University were asked to assist with evacuees. One of their responses was to move their mobile health clinic, the Jag Mobile, to a trailer park that was home to 1,700 displaced residents of New Orleans and the surrounding area. The Jag team was able to obtain a written agreement with the Federal Emergency Management Agency (FEMA) to deliver services in this almost exclusively special-needs community. For 3 days each week, the team provided health screening, assessments, physicals, prescriptions, health teaching, referrals, free prescription plan services, pediatric and dental care, and coordination of care for mental health, vision, vaccinations, substance abuse issues, and OB/GYN services to patients within walking distance of their trailer homes. The local nurses and nurse practitioners staffing the Jag Mobile had essential knowledge of the local health services and referral providers, and had the social capital needed to get work done. The nurse practitioners' authority to make assessments, diagnose patients, and provide treatment gave the clinic the independence it needed to serve this community directly, on-site.

(Rami, 2006).

2.2. Planning for the Role of Nurses in Surge Events

In public health emergencies, disasters, MCEs, or surge events, the healthcare and public health systems are called upon to evaluate and care for a larger-than-normal volume of patients, as well as provide more disease surveillance and related services. As the demand for services increases, the capacity of the nursing workforce must expand to meet this surge in need.

Surge events can arise suddenly, as in the case of a bombing, and cause large numbers of casualties at the outset. Surge events can also take time to come to full force, as with biological events like bird flu or pandemic influenza, resulting in a more gradual increase in the number of people affected, but eventually rising to catastrophic numbers (Phillips & Knebal, 2006). The skills required of the healthcare workforce and manner in which they are deployed varies depending on the type of surge event. For example, in a sudden impact event, there is an immediate demand for many healthcare workers to provide a full spectrum of coordinated care efforts for a large number of victims at one time. During biological (e.g., infectious disease outbreak) events, the starting point is usually unclear and the timeline for delivery of resources depends on both the effectiveness of the surveillance effort and how quickly casualties appear. Biological events, however, usually result in surge capacity response needs over a longer time period than a sudden impact event, where the increased demand for services exists in a more compressed timeline (Barbisch & Koenig, 2006).

Nurses make up the largest component of healthcare workers in a hospital. Emergency Department nurses are on the front lines of patient care and would be among the first to be affected in the event of a mass casualty incident. They must be prepared to handle an influx of patients experiencing multiple medical issues and exposures.

Meeting the needs for nurse "surge capacity" is challenging today because of the existing nurse shortage, and will be more difficult in the future when even greater shortages are predicted.

Delivering effective healthcare responses to different types of surge events requires a prepared and integrated healthcare workforce. In an emergency, the affected population may require emergency medical services, hospital care, out-of-hospital healthcare (e.g., clinics, nursing homes, home health, hospices), and coordination of care among these components. In addition to providing hands-on care, nurses play vital roles as integrators of our multidisciplinary healthcare system and coordinators of community responses to healthcare and public health needs. As such, nurses' contributions to policy and planning for surge events are essential.

A surge event will likely place stress on the critical healthcare infrastructure, which may be impaired during an emergency. In such cases, healthcare services may need to be delivered in alternative sites and with improvised tools and volunteer staff. The length of time for which these services must be sustained before external resources arrive is an important component in planning for surge emergencies (Slepski, 2006).

All of these issues have impact on, and can be informed by, the nurse workforce. Saunders (2007) noted the importance of nurses to improve mental health assessment and services at the time of a disaster through advocacy, triage, and teaching disease prevention strategies.

Given the current nursing shortage, meeting surge capacity needs would be especially difficult. It is critical to continue to support existing recruitment and retention programs so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the surge emergency. Healthcare information technology (IT) can help to meet surge capacity needs by facilitating advanced registration of volunteers and the establishment and maintenance of a database of health professionals.

> "While nursing is well known for its hands-on care delivery, what is less understood is the vital role that nurses play as integrators of the multidisciplinary team and coordinators of community partners. As a major player in the healthcare system, nurses also need to be included in health policy and decision-making as they can inform such decisions from the unique perspective that they bring to the policy table."
>
> (Assistant Surgeon General Romano, July 2006, as cited by Drehobl, 2006, slide 53)

Nurses must have personal emergency response plans in place to ensure that their own families are safe and cared for before they will be able to respond to – and appropriately focus on – surge events. Nurses and other workers must be assured that the facility in which they are employed will take all precautions to protect them from exposure to risk.

Nurses' Roles in Hospitals

Hospitals would likely become focal points in provision of care during a surge emergency. A facility's ability to handle a sudden increase in patient volume (surge capacity) is a major factor in the hospital management of mass casualty incidents (MCIs), yet many hospitals report that they are at, or over, patient capacity in their emergency departments during normal times (Jasper et al., 2005). Although hospitals and acute care facilities need to maximize care for the greatest number of people in the event of a disaster, an environment of scarce resources might make it difficult to provide normal standards of care. Because of the requirements for surge capacity and the need for emergency and trauma services, alternative care sites would need to be designated if hospitals and traditional venues of healthcare became overwhelmed or inoperable. Plans are needed for care delivery in alternative sites to manage patients under difficult conditions, with limited supplies and equipment, obstacles to obtaining medicines, and minimal staff. Some individuals may survive an initial disaster but sustain life-threatening injuries and illnesses, necessitating that decisions be made to maximize the number of patients saved with constrained resources while providing comfort and symptomatic relief to those who are dying.

Jasper and colleagues (2005) evaluated hospital preparedness for a MCE involving radioactive materials through a full-scale regional exercise involving 11 hospitals and 358 victim-observers. The exercise consisted of a series of medical and trauma scenarios involving explosions at three major transportation hubs resulting in blast injuries and radioactive contamination. An evaluation tool completed by 327 participants showed a lack of consistency among the various hospitals in use of equipment, treatment, or procedures offered to "victims." Fewer than 10 percent of respondents strongly agreed that hospitals were ready for a MCE and the majority (over 60 percent) disagreed that hospitals were prepared for a mass casualty disaster.

In another study, Niska and Burt (2005) evaluated the content of hospital terrorism preparedness plans, examining whether they had been updated since September 11, 2001. Their review of bioterrorism and mass casualty preparedness in hospitals looked for hospital collaboration with outside organizations; clinical training in the management of biological, chemical, explosive, and nuclear exposures; response plan drills; and equipment and bed capacity. The researchers' study was based on the 2003 National Hospital Ambulatory Medical Care Survey, which included a Bioterrorism and Mass Casualty Supplement, sent to about 500 U.S., non-Federal, and short-stay hospitals. Survey findings showed that 97 percent of the hospitals had plans for responding to natural disasters (a Joint Commission on the Accreditation of Healthcare Organizations [JCAHO] accreditation requirement), but fewer had plans for responding to chemical (86 percent), biological (85 percent), nuclear or radiological (77 percent), and explosive incidents (77 percent). While about three-quarters of the hospitals had provisions for cooperation with appropriate outside entities, fewer than half had written memoranda of understanding with community facilities to accept inpatients during a declared disaster. Training for hospital staff for any exposure ranged from 92.1 percent among nurses to 49.2 percent for medical residents. Only one-fifth of these hospitals performed practice drills for explosions, the most common form of terrorism.

> "'Nurses have always answered the call to service during times of war, epidemic, and natural disaster," said ANA President Rebecca M. Patton, MSN, RN, CNOR. 'But in the aftermath of a catastrophic event, registered nurses and other health professionals are often forced to make difficult decisions with regard to patient care.'"
>
> (American Nurses Association holds major policy conference "Nursing care in life, death and disaster," 2007)

In a phone survey concerning disaster preparedness among 45 hospitals in Los Angeles County, Kaji and Lewis (2006) examined hospital disaster plan structure, vendor agreements, communication modes, medical and surgical supplies, involvement of law enforcement, mutual aid agreements with other facilities, training and drills, surge capacity, decontamination capability, and pharmaceutical stockpiles. Surge capacity was assessed through monthly emergency department diversion status, available beds, ventilators, and isolation rooms. Although most of the hospitals reportedly had plans and protocols, preferred vendor agreements, and extra supplies, fewer involved law enforcement (56 percent), mutual aid agreements with other hospitals (20 percent), or long-term care facilities (7 percent). The majority conducted multi-agency drills, but only 16 percent involved other agencies in their disaster training. Less than a third (29 percent) had a surge capacity of more than 20 beds and only 42 percent had 10 or more isolation rooms. Of hospitals surveyed, the majority (60 percent) were on diversion more than 20 percent of the time. Notably, almost all of the hospitals reported that the current nursing shortage had a substantial negative effect on surge capacity.

Acknowledging that most U.S. hospitals are not prepared to respond to medical catastrophes, Beranek (2007) proposed the following strategies for successful regional exercises: plan collaboratively with hospitals, emergency medical services (EMS), healthcare organizations, health departments, emergency management agencies, fire department, and law enforcement agencies; exercise and drill collaboratively; and take action on lessons that have been learned such as paying attention to surge planning and promoting effective training and communication.

These findings point to the need for support for hospitals in developing preparedness plans in the event of an emergency. The plans should be developed in cooperation with the Department of Health and Human Services (DHHS), Department of Homeland Security (DHS), states, and nursing associations

and should address nursing-specific issues such as movement of nurses across states, credentialing, communication, and security issues to ensure the protection of caregivers from any unlawful behavior of the public.

Roles of Different Components of the Nursing Workforce

An integrated, cohesive response to a surge event requires planning for and coordination of the roles of various healthcare professionals, including nurses. Nurses in different specialties have different skills as a result of their professional training and experience. Therefore, each component of the nurse workforce brings different resources to a surge emergency response. Nurses with different backgrounds and skill sets would be involved in responding to a surge event, including public health and community health nurses, advanced practice nurses, home health nurses, and occupational health nurses. The potential roles for these nurses are set out in the chart below.

Table 3: Roles of Nurses in a Surge Event

Type	Role
Hospital nurses	Hospitals are likely to see increased numbers of patients in a surge event and hospitals nurses are likely to be among the key responders. Emergency department nurses will face higher numbers of patients with serious injuries or illnesses as a direct result of the event. Other hospital nurses would be needed to care for patients with less severe conditions or those suffering from secondary illnesses or conditions.
Public health and community health nurses	Public health nurses bring training and expertise in epidemiology and disease surveillance to planning for, and responding to, surge emergencies. They play key roles in all areas of the country, but their role is especially significant in rural areas where the local public health nurse may be the only healthcare provider. Their training in preparedness enables public health nurses to assess a community's needs quickly and respond to those needs (Association of State and Territorial Health Officials, 2004a).
Advanced practice nurses (i.e., nurse practitioners, nurse anesthetists, certified nurse midwives, and clinical nurse specialists)	Advanced practice nurses bring specific areas of clinical expertise to surge events. Most advanced practice nurses have some independent practice authority, so these nurses can lead medical teams, diagnose and prescribe treatments, and make referrals to other providers. With these skills and independence, advanced practice nurses are critical to surge emergency responses.
Home health nurses	Home health nurses have unique opportunities to help vulnerable populations prepare for disasters. As providers who work in patients' homes, home health nurses can identify the threats most likely to affect the patient, observe any preparations the patient has in place, and recommend additional emergency planning measures that the patient should execute (Rodriquez & Long, 2006).
Occupational health nurses	Occupational health nurses may be first responders in emergencies, such as in the case of a bioterrorism attack, or if an earthquake limits entry or exit from a worksite. In addition, occupational health nurses, especially those who have implemented disaster planning, are well-placed to recognize adverse biological events, guide responses to emergencies and disasters, help recognize and prevent panic, provide relevant information, and coordinate emergency responses for the site (Salazar & Kelman, 2002).

2.3. The Federal, State, and Local Roles

Healthcare's plan for surge events must include coordination of services among Federal, state, and local government and private entities. Lines of authority and supervision must be clarified and communicated. Planning efforts are underway at the state and local level. Additionally, various state Boards of Nursing, professional organizations, and private organizations have developed plans for helping to mobilize nurse responses to surge emergencies. Related issues include financing of services, resolving whether the scope of practice regulations remains intact or is relaxed, deciding whether liability protection for patients will be modified, and determining what type of on-the-job injury compensation applies to employed and volunteer workers.

Federal initiatives have resulted in a number of programs including the National Disaster Medical System (DMAT), the Emergency System for Advance Registration of Volunteer Health Professionals (ESAR-VHP), and the establishment of Public Health Training Centers across the country, as well as Academic Centers for Public Health Preparedness (ACPHP), as partnerships among academic institutions, public health agencies, and community organizations. The Health Resources and Services Administration's (HRSA) Division of Nursing has a statutory funding preference for projects that substantially benefit rural or underserved populations or that will help meet public health nursing needs in state or local health departments.

Effective terrorism preparedness and response requires similar workforce-related information and coordination from partners in medicine, law enforcement, first response, primary care, and many others (Lichtveld, Cioffi, Henderson, Sage, & Steele, 2003). To ensure proper preparedness, there must be a clear connection between departments of public health and all other healthcare entities (Markenson, DiMaggio, & Redlener, 2005). Since 2000, the Center for Disease Control (CDC), along with a number of partner organizations, has developed a national strategic plan for public health workforce development. These partner organizations include professional associations; governmental agencies at the local, state, and Federal levels; practice academia; and organizations in the private sector. The CDC is working with these partners to develop state-based needs assessments. Among the objectives of these assessments is to facilitate the development of effective plans for training and surge capacity.

A comprehensive report produced by the Agency for Healthcare Research and Quality (AHRQ) titled "Providing Mass Medical Care with Scarce Resources: A Community Planning Guide" (Phillips & Knebel, 2006) was designed to help communities plan for and respond to catastrophic health and MCEs. While local emergency management services would be called on to provide first-responder rescue, assessment, care, and transportation to emergency healthcare facilities, the authors found there was no single oversight agency to ensure consistency in training, certification, or guidelines for disaster response, protective equipment, or coordination of operations.

The National Advisory Council on Nurse Education and Practice recommends that the DHHS continue to work with the DHS, states, and nursing organizations to build surge emergency planning into existing practice at national, state, local, and facility levels. Such planning should address the needs of special populations (e.g., people with disabilities, elderly individuals, rural populations). In addition, the National Advisory Council on Nurse Education and Practice recommends an independent evaluation of the various programs that are intended to improve nurse preparation for surge emergencies to assess their likely effectiveness in the event of a MCE, before such an event occurs.

2.4. Summary

Nurses are critical to the effective delivery of all healthcare and public health services, and they are integral to surge capacity, emergency planning, and response. Nurses have been both first responders and sustained responders, treating victims of public health crises resulting from natural and human-made disasters. Their experiences should be recorded and made widely available in order to improve the nation's responses to public health emergencies. As described in section 2.3, a number of programs and initiatives are in place with the objective of providing disaster planning that includes preparations for surge emergencies. However, the ultimate effectiveness of these efforts has not been thoroughly evaluated and gaps remain. These shortfalls include the existing shortage of nurses; lack of comprehensive national nursing standards of care for surge events; lack of clarity regarding the roles of programs at the Federal, state, and local levels; and insufficient development of individual family disaster plans for practicing nurses.

To address these deficits, the National Advisory Council on Nurse Education and Practice recommends that DHHS support initiatives to develop national nursing standards of care for triage and ongoing patient management during surge events. The Council also recommends that DHHS commission a study to identify nursing-related lessons learned from recent events like Hurricane Katrina. The DHHS should support an initiative to encourage nurses to promote the development of individual family disaster plans. In addition, the DHHS should provide funding for an independent evaluation of programs that are intended to improve nurse preparation for surge emergencies. Finally, the National Advisory Council on Nurse Education and Practice recommends that DHHS continue to support existing recruitment and retention programs so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the surge emergency.

3. Preparation through Nursing Education

3.1. Continuing Education for Disaster Preparedness

Registered nurses (RNs) who are currently licensed and actively practicing would likely be among the first healthcare providers to respond to surge events. Because of their large numbers, nursing education, and perspective from practicing in multiple roles and settings, nurses are a critical component of disaster response.

Proper training for a disaster response situation is critical for effective execution of a response plan. Poor execution can cause even a well designed plan to fail. All nurses from novice to expert should have basic knowledge and ability to respond appropriately to MCIs. While not all nurses can or should be prepared as first responders, all nurses should have basic competencies to respond to MCIs. To maximize disaster preparedness, training should provide nursing staff with the knowledge and skills required to respond to a biological or chemical terrorist attack.

> "There is complacency about getting and staying prepared…We need to do more than just talk about the situations; we need to engage nurses with specific knowledge of how to deal with specific (disaster) situations."
>
> (Maddox, 2006)

In a survey conducted in 2000, Rose and Larrimore (2002) found that most healthcare providers feel underprepared and/or unprepared to respond to disasters. The authors found that of 291 nurses, physicians, nursing students, and medical students, fewer than 23 percent of the respondents reported feeling confident in their abilities to provide healthcare in a hypothetical chemical terrorism situation. Research indicates a need for the development, implementation, and evaluation of innovative domestic terrorism preparedness programs for use in nursing continuing education and staff development. Findings from a study conducted in the Washington, DC area showed that many practicing RNs had received little or no training in emergency response, and very few had any hands-on interdisciplinary experience in emergency or disaster situations (Maddox, 2006).

In addition, given the overall nursing shortage, it will likely be necessary to identify and train a supplemental workforce (e.g., retired nurses, inactive nurses, faculty in schools of nursing, other healthcare professionals who can be cross trained) to provide healthcare during surge emergencies. The Vanderbilt University School of Nursing is developing training that is intended to prepare inactive nurses to respond to public health emergencies (Agency for Healthcare Research and Quality, 2004). The project targets inactive nurses who have volunteered for the Medical Reserve Corps in their local communities. One emphasis of the program addresses the value shift that may be required in a large public health emergency – for example, the traditional approach to triage may need to change. In a normal hospital scenario, the most critically ill patients generally receive the most urgent and focused treatments, regardless of possible disproportionate resource utilization. On the other hand, a MCE requires that the triage nurse's decisions must be based on what will do the most good for the greatest number of people. Ultimately, the critically ill person may not be the one who should be treated first (Agency for Healthcare Research and Quality, 2004).

The Federal Government has supported nurse education related to emergency preparedness for MCEs. A 2-year plan to train 10 percent of multidisciplinary health professionals to respond to terrorism and

emerging infections was implemented as part of a HRSA-funded national effort involving 19 states (Ablah, Molgaard, Fredrickson, Wetta-Hall, & Cook, 2005). Assessments following the training conferences demonstrated significant improvement in four bioterrorism objectives: the ability to recognize a terrorist attack, the ability to participate in a response plan, the ability to meet patient needs, and the ability to alert the public health system. Nurses showed significant improvement in scores from the previous testing period, although they rated their own competencies and confidence lower than did other health provider types. The authors advocate the addition of practice in desired skills to the lecture-oriented training (Ablah et al., 2005).

The purpose of HRSA's National Bioterrorism Hospital Preparedness Program is to ready hospitals and supporting healthcare systems to deliver coordinated and effective care to victims of terrorism and other public health emergencies. "The HRSA is assisting awardees to shift from content-focused training toward competency-based training" (Agency for Healthcare Research and Quality, 2004, p. 3). Instead of emphasizing knowledge about smallpox, anthrax, or radiation illness, nurses would be expected to be able to describe and demonstrate their emergency response roles (Agency for Healthcare Research and Quality, 2004).

Section 811 of the Public Health Service Act, as amended by the Nurse Reinvestment Act (NRA), authorizes the Secretary to make grants to meet the costs of projects to prepare advanced education nurses by enhancing advanced nursing education and practice. These grants have been used to support emergency preparedness training. In addition, they have supported several programs to enhance infection control, like at Loyola University of Chicago. Loyola University prepares Master's level advanced education nurses with expertise in Population-Based Infection Control and Environmental Safety (PICES). This effort is integrated into a community safety program.

A number of programs have focused on designing and delivering continuing education. To support this effort, increased funding is needed to support the development and implementation of continuing education on nursing care during surge emergencies. Continuing education, including Web-based training, should be designed for nurses and educators, and be applicable to practicing nurses as well as those who are not active in the clinical workforce. There are several alternate modalities in which continuing education programs can be structured and delivered. A study of 103 advanced practice nurses by Charles and Mamary in 2002 found that preferred methods of presenting information were in-person conferences or computer-based training characterized by short, direct information sessions with opportunities for questions and answers; instruction provided on the actual practice floor/unit environment; and presentations. The integration of accurate, reliable, and timely information into staff development programs will contribute to the advancement of a national nursing workforce adequately prepared to respond to a MCE (Veenama, 2003).

The National Advisory Council on Nurse Education and Practice recommends and supports efforts to provide funding to support the development and implementation of continuing education in nursing care during surge emergencies.

3.2. Incorporating Disaster Preparedness Preparation in Entry-Level Nursing Curricula

As the largest component of the heath care workforce, nurses are a critical part of disaster response efforts. Domestic terrorism knowledge and awareness is low among nursing students; therefore schools

of nursing should integrate bioterrorism disaster response into their curricula to better prepare students for this growing component of healthcare management (Steed, Howe, Pruitt, & Sherrill, 2004).

Curricula that incorporate bioterrorism preparedness and emergency response material are key to enabling nursing graduates to gain occupational competencies related to emergency response. Until recently, however, there has been insufficient focus on developing this type of curricula. Several organizations including the American Association of Colleges of Nursing (AACN), the Joint Commission on Accreditation of Healthcare Organizations, and many state health departments have called for the establishment of education related to disaster response.

Prior to the events of September 2001, only a few graduate programs had introduced courses teaching medical, public health, and government professionals about the comprehensive defense required against biological weapons and bioterrorism (Dembek, Iton, & Hansen, 2005). All entry-level nursing education programs should integrate the necessary knowledge and experiences for disaster preparedness throughout the nursing curricula (Stanley, 2005). Upon graduation, nurses should have sufficient knowledge and skill to demonstrate these competencies.

There is a great deal of information related to the management of disaster response; identifying, validating, and prioritizing which information should be included in curricula is a significant effort. Currently states are duplicating efforts to create standards and therefore they are creating inequities due to a lack of standardization (O'Brien, 2006). Several programs have focused on designing and delivering curricula for schools of nursing.

Table 4: Examples of Education Programs

Program	Description
Academic Centers for Public Health Preparedness Program (ACPHP)	In 2000, the CDC established the ACPHP program. This national network of 31 centers is focused on enhancing front line readiness for current and emerging health threats. One of the major goals of the Centers is to "develop, deliver, and evaluate competency-based training and education programs based on identified needs of state and local public health agencies for building workforce preparedness and response capabilities" (Centers for Disease Control and Prevention, 2005, p.1).
First Contact, First Response	This project, led by the Association of American Medical Colleges, is an effort to influence curricula, residency preparation, and, potentially, board certification for physicians to ensure preparedness for diagnosis, treatment, and consequence management of weapons of mass destruction. A similar project is underway in schools of public health through the Association of Schools of Public Health.
Columbia Center for Public Health Preparedness	In the spring of 2001, the Columbia Center for Public Health Preparedness, in partnership with the New York City Department of Health, developed an emergency preparedness training program for public health workers. A study conducted by the Center found that 90 percent of the nurses reported at least one barrier that would affect their ability to report to duty in the event of a public health emergency. The most frequently cited barriers included child/elder care responsibilities, lack of transportation, and personal health issues (Qureshi, Merrill, Gershon, & Calero-Breckheimer, 2002). These findings suggest that it may be prudent to identify and address potential barriers to public health workforce responsiveness to ensure the availability of the workforce during emergencies.
Case Western Reserve University	Case Western Reserve University prepared acute care nurse practitioners as Flight Nurse Specialists to provide advanced assessment, diagnosis, and treatment interventions to acutely ill and injured patients in a variety of settings (Sandvold, 2006).

While programs such as these are promising, complete success in integrating disaster response content into nursing curricula will require overcoming barriers. Nursing school curricula is very tightly scheduled with little room to add new content. In addition, there is no approved body of content or curricula in public health emergency response. Inadequate funding and time to develop curricula and course materials combined with shortages of faculty and teaching materials in the area of disaster preparedness are also major obstacles. Finally, there is no oversight group designated to assist in the development, management, and revision of curricula and materials on disaster preparedness for nurses.

In response to concerns about bioterrorism and inadequate preparedness for responding to disasters, the International Nursing Coalition for Mass Casualty Education (INCMCE) conducted a study to determine the types and levels of disaster preparedness curricula in nursing education programs. INCMCE surveyed 2,013 deans or directors of nursing schools regarding curricula for emergency preparedness before and after September 11, 2001. Only 5.2 percent of respondents felt their faculty were well prepared to teach disaster preparedness content (Weiner, 2006). Reinforcing those findings, the majority of faculty report feeling "not at all" or "poorly" prepared to be teaching techniques for handling MCEs; clearly there is an urgent need to address "train the trainer" issues. INCMCE has developed five modules reflective of the nursing curriculum for emergency preparedness (Weiner, 2006).

INCMCE's survey of deans and directors of nursing schools found that curriculum plans, followed by competency lists, were reported to be the most helpful tools for teaching content in disaster preparedness. The survey results demonstrate that nursing programs provide insufficient curricula in this area. The mean number of hours of disaster preparedness content provided in nursing education programs (approximately 4 hours) did not change significantly over 3 academic years. The study also showed that 75 percent of respondents thought that nurse faculty members were inadequately prepared in the area of disaster management.

Therefore it is necessary for HRSA to support initiatives to integrate surge care-related coursework into curricula for nursing programs. Initiatives should also address faculty development and encourage accrediting organizations to consider including surge preparedness concepts in their standards. Curricula should include topics that will enable nurses to engage in the range of activities they are likely to encounter in a MCE. Veneema and colleagues (2003) suggest a comprehensive curriculum that includes topics such as biological and chemical agents, biological and chemical terrorism, surveillance systems, roles of various agencies, patient decontamination and mass triage, mass immunization and prophylactic antibiotics clinics, therapeutic modalities and the nation's pharmaceutical stockpile, management of psychosocial effects of chemical and biological terrorism, and nursing leadership during major public health emergencies.

It is also vital to recognize that a fundamental challenge in dealing with a MCE is the current nursing shortage. If there are not enough nurses before a MCE, there will be even a greater shortfall during an emergency. Therefore it is important to develop ways to include inactive nurses in the response effort. Inactive nurses and volunteers are more difficult to contact and provide with regular disaster readiness preparation. For these nurses, "just in time" training and assessment of clinical competencies may be needed before they can be incorporated into an integrated emergency response situation. Given the overall shortage of nurses, it is important not to lose sight of the broad effort to increase the number of nursing students in the pipeline. HRSA should continue to support programs that increase the capacity of nursing education and increase nurse supply so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the surge emergency.

3.3. Summary

Recent education initiatives for disaster response training have focused on the existing healthcare workforce. However there is also a need to prepare nursing students so that graduates have basic competencies in disaster response. Education for disaster response should include competencies such as detection and reporting of an unusual outbreak, treatment of casualties, preparedness planning, and management of public reactions (Lichtveld et al., 2003). This could be delivered, for example, as a full semester course, consisting of traditional class lectures, supplemented with a project assignment for each student. Students could select project topics from a list of associated subject matter (e.g., anthrax, rural issues, disaster planning).

American nurses have always responded selflessly to assist in times of natural and manmade disasters, and the country will look to nurses to respond to any future disasters. In order for nurses to be well prepared for disaster response, not only must guidelines and recommendations be in place, but nurses must also be properly trained to ensure that they can recognize and respond to emergency events. Nurses should be able to demonstrate an understanding of the event and its impacts on individuals and resources. They should understand their facility's and community's emergency response plans, their roles as healthcare providers, and their facility's role as part of the overall response effort.

Healthcare facilities and continuing education programs should incorporate training in disaster preparedness to provide the essential foundations for safe and effective healthcare. Advanced training in disaster preparedness provides nurses with valuable skills to fill the nationwide need for prepared first responders.

The National Advisory Council on Nurse Education and Practice recommends that HRSA support these efforts by supporting key education-related efforts. These include support for initiatives to integrate public health emergency or disaster care-related coursework into curricula for nursing programs and funding to support the development and implementation of continuing education on nursing care during national emergencies. In addition, the National Advisory Council on Nurse Education and Practice recommends that DHHS support efforts to identify and train supplemental workforce (e.g., retired nurses, inactive nurses, faculty in schools of nursing, other healthcare professionals who can be cross trained) to provide healthcare during large scale emergencies. Finally, the National Advisory Council on Nurse Education and Practice recommends that DHHS should continue to support programs that increase the capacity of nursing education and increase nurse supply so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the surge emergency.

4. Use of Technology in Public Health Emergencies

Healthcare IT can play an important role in disaster response, facilitating advanced registration of volunteers, establishing and maintaining a database of health professionals, bio-surveillance, tracking hospital bed availability, tracking patients, and maintaining patient records. Disasters such as the terrorist attacks of September 11th, 2001, the 2001 anthrax scares, and Hurricanes Katrina and Rita have revealed several ways in which technology infrastructure gaps inhibited an effective response.

For instance, multiple national volunteer registration systems exist simultaneously, which results in duplication in volunteer databases as individuals may be on more than one registration list. This duplication makes it difficult to estimate rates of response to surge events (O'Brien, 2006).

After the September 11th terrorist attacks, more healthcare responders arrived on the scene in New York City than were needed. However, most of them were not part of an emergency response plan and were not properly organized for response (Weiner, 2006). It became evident that there was a need in New York state for a database of registered nurses who could be called upon as volunteers in public health emergencies. The New York State Nurses Association worked with the New York State Department of Health to develop the NurseResponse program, which eventually registered more than 1,000 RNs. Although the system was not used after Hurricane Katrina, that disaster demonstrated that NurseResponse could be activated on short notice when the need arose.

> "'[Hurricane] Katrina has made a compelling case for the public, the government, and the healthcare industry on the need for the electronic patient record' Abbott asserted. 'We need a skilled informaticist to lead us in that charge. There's an increasingly heavy need for cross-trained individuals—nurses, physicians and pharmacists—who understand both the clinical side and the IT side, to marry the two.'"
>
> (Orlovsky, 2005, para. 8)

Another example of how healthcare IT could improve patient care was demonstrated in the wake of Hurricane Katrina. There were many survivors left with no medical records and, often, no recollection of what medication they were taking. Many elderly adults did not know who their caregivers were (Orlovsky, 2005). Portable patient records could have helped to fill those gaps. Electronic Health Records (EHRs), which provide caregivers timely access to patient health information, would help prevent medical errors and meet the needs of victims. Such portable records would greatly improve the efficiency and effectiveness of nurses, as well as other health professionals.

There are currently several federal initiatives focused on increasing the adoption of healthcare IT in healthcare and some specifically in nursing. For example, the Office of Health Information Technology, in HRSA, has the mission of promoting the adoption and effective use of healthcare IT in the safety net community (Casnoff, 2007). HRSA's Office of Health Information Technology funds six Health Center Controlled Networks to focus on clinical data, care models, and EHRs through the integrated information and communication (ICT) initiative. AHRQ is also working to assist in developing an HHS strategic framework for healthcare IT. AHRQ objectives include developing and assessing alternative approaches to ensuring healthcare surge capacity, models that address training and information needs, alternative uses of IT and electronic communication networks, and protocols and technologies to enhance interoperability among healthcare systems.

4.1. Advanced Registration of Volunteers

Registering and credentialing volunteers in a national database is one of the areas in which healthcare IT can assist when there is a need for surge capacity brought by a disaster. Currently many states have volunteer databases. A national database of volunteers, linked to the other databases, may allow for improved coordination of volunteers. A federal database, or a system that links state- and association-level databases and checks for duplication, may ultimately be more accurate than relying on many different state and association-based databases. Using the separate databases may result in double counting as nurses may be in multiple databases. This would be important when coordinating nurse responders with other regional and federal resources such as the Strategic National Stockpile.

To maximize the effectiveness of a response to an emergency, certain issues must be clarified. For example, the relationships and responsibilities between DHHS and DHS currently are not entirely clear (O'Brien, 2006). Also, it is not apparent how the state-based ESAR-VHP system fits in with other components of the nation's infrastructure. In a large scale surge emergency, clearer protocols must be developed for how the state-controlled resources are accessed. Protocols must be established and comprehensible, but at the same time, allow for flexibility to react to what might be a rapidly changing crisis situation.

> " 'Nurses will drop everything they are doing to go where they are needed,' Velazquez said. 'Altruism is at the core of nursing. It's who we are.'"
>
> (Trossman, 2001, para. 37)

In the event of an emergency, information about volunteers must be available to hospitals and other institutions providing care. The final decision about how to use a volunteer should rest with the institutions, especially when volunteers are asked to cross state lines. Liability and benefits issues such as coverage by worker's compensation, which is a state-based system, would need to be assessed to determine the extent to which, or if, it applied to out-of-state volunteer "employees."

4.2. Bio-Surveillance

Disasters such as hurricanes or bombings have clear-cut beginnings. However, in the case of disasters such as pandemic outbreaks, there may not be such an obvious start to the timeline. The impact of such events depends largely upon early detection (Estasio, 2006) which requires effective surveillance for the earliest possible detection of an event. Nurses are frequently the first point of contact for a patient entering the healthcare system and therefore may be the first to detect or diagnose an individual with signs and symptoms of the biologic agent responsible for an outbreak. Nurses may find themselves in the front-line position to identify the presence of a disease, notify authorities, and implement countermeasures (Rotz et al., 2000). Each time a nurse enters patient information into emergency department records or EMRs, that data may be used by surveillance data collection systems which attempt to detect unusual patterns of disease or injury. Early recognition and detection of infectious diseases is important to allow providers to administer effective prophylactic treatment in a timely manner and to minimize the opportunity for transmission of the agent (Veenema, 2003).

4.3. Hospital Bed Availability and Patient Tracking

In order for the healthcare system to expand rapidly to meet the increased demand for medical care, it is critical to optimize management of essential resources including hospital beds; personnel to staff the beds, facilities, equipment, and pharmaceuticals; and a system to move, regulate, and track placements. To manage hospital resources effectively, healthcare professionals need information such as which emergency departments are on diversion and what services are available. The National Hospital Available Beds for Emergencies and Disasters (HAvBED) System, a demonstration model funded by AHRQ, explores the feasibility of a national real-time hospital-bed tracking system to address a surge of patients during a MCE. The purpose of the model is to enhance a system's or region's ability to care for a surge of patients by providing timely reporting of bed status data in an emergency (Agency for Healthcare Research and Quality, 2005).

The HAvBED system is under revision for DHHS adoption. Next steps for adoption include defining bed capacity standards for consistent counting, incorporating monitoring systems and producing and analyzing information, and developing a mechanism for collecting bed availability data (Phillips & Knebel, 2006).

In addition to hospital bed availability data, effective patient tracking is essential. The National Mass Patient and Evacuee Movement, Regulating, and Tracking System project has two key goals related to patient tracking. The first goal is to build a planning tool for use before a MCE or mass evacuation incident to estimate shortfalls in resources to transport patients and evacuees. The second goal is to develop recommendations for a system that could be used during a large scale, multi-jurisdiction MCE or mass evacuation incident in order to locate, track, and regulate patients and evacuees (Phillips & Knebel, 2006). Systems that facilitate patient tracking, improve communication, and monitor patient flow allow nurses and other healthcare providers to deliver better continuity of care.

4.4. Provision of Patient Records

In the wake of Hurricane Katrina, large numbers of paper medical records maintained by physicians, hospitals, nursing homes, and other healthcare facilities were destroyed. Many patients whose paper medical records were lost could not receive needed treatment and medications because diagnoses and treatment histories were not available (Lowes, 2005) . However, users of EMRs were able to preserve their systems and patient information (United States Department of Health and Human Services, 2005). The electronic record usually includes backup systems, and if systems are operable at the point of care, there is greater likelihood than with paper records that files can be recovered and/or linked. Without effective electronic health records, it is more difficult to administer medications and provide patient care in emergency circumstances.

> "While paper charts of untold thousands of Gulf Coast patients were washed away or irretrievably damaged by the floodwaters of [Hurricane] Katrina, the EHR lived up to its promise…The EHR system for the VHA, a work in progress for the past 20 years, has been touted as a model for the entire U.S. healthcare system."
>
> (Lowes, 2005, para. 4)

4.5. Summary

New technology provides significant opportunities for improved preparation for disasters and management of resources in the event of a disaster. It is critical that the Federal government and the private sector work together to establish infrastructure and policies to make these technologies available to nurses and other healthcare providers for use in the event of a disaster. In particular, the National Advisory Council on Nurse Education and Practice recommends that HRSA should continue to support initiatives to help ensure that nursing-related workforce information systems, such as volunteer databases, are accurate, compatible, and accessible through a variety of systems and devices.

5. Caring for Special Populations During Surge Emergencies

When planning for disaster response, it is important to examine the unique circumstances surrounding these diverse settings (e.g., rural vs. urban locales, hospital vs. community settings) as well as the special populations receiving nursing care (e.g., infants and children, pregnant women, patients with disabilities). While all populations are vulnerable during a major disaster, some populations are especially at risk because of their limited access to healthcare or special needs that must be addressed even in the best of times, and which may be greatly exacerbated during a major crisis.

5.1. National Emergencies and Special-Needs Patient Populations

There are special barriers to healthcare needs among disadvantaged individuals that are particularly problematic in the event of a surge emergency. Those affected may include children, pregnant women, elderly individuals, people who are impoverished, those with limited English-language skills, and those with disabilities or who are otherwise medically fragile. This group can represent 20 percent or more of the total population (Cameron, 2006). Barriers to care may include limited access, cultural competence, and attitudes towards and fears about the healthcare system.

> "Nurses are well positioned to address these barriers to providing care for special populations because of their availability, knowledge of local health services, prescriptive authority, ability to assess and make nursing diagnoses, cultural competence, and expertise in health teaching and disease management."
>
> (Rami, 2006)

Interviews conducted with randomly selected impoverished, minority residents of major evacuation centers in Houston, Texas following Hurricane Katrina underlined the need for better community-based disaster preparation strategies that address specific obstacles encountered by these populations (Eisenman, Cordasco, Asch, Golden, & Glick, 2007). Stallwood (2006) noted the importance of nurses and healthcare providers assessing the emergency preparedness of families caring for young children with chronic illnesses like diabetes; the care providers should check for the presence of medical alert identification and emergency kits. The special needs of pregnant women, women giving birth, and newborns must also be addressed in preparing for and responding to surge emergencies. Jolivet (2006) pointed to the expertise and special skills of nurse midwives in normal birth, triage, and low resource settings, but called for guidelines to meet the essential care needs of pregnant women, new mothers, newborns, and infants in the wake of a health crisis or disaster, as well as identification of individuals and organizations who can coordinate that care.

Disaster plans should also take into account the special requirements of the elderly and people with disabilities (Lach, Langan, & James, 2005; Saunders, 2007). Lach and colleagues (2005) emphasized the need for nurse workforce planning to evacuate and care for elderly individuals in the event of a disaster such as a hurricane.

In preparation for the 2004 hurricane season in Florida, local health department staff pre-registered and identified individuals to be placed in special needs shelters well before the storms. Special needs shelters or medical needs shelters provide locations to house individuals whose physical or mental

conditions require limited medical or nursing oversight with more medical resources and individual care than can be provided in a general shelter (i.e., shelters operated by the Red Cross and other volunteer organizations). Each county health department was responsible for defining individuals with special needs in their communities. These descriptions were created in conjunction with the local hospitals, local nursing homes, emergency responders, and members of the community. The process allowed for jurisdictional flexibility in identifying existing health resources and matching them to the requirements of the special needs community (Association of State and Territorial Health Officials, 2004b).

In the aftermath of the 2004 storms, several key lessons emerged in regard to the sheltering of special needs populations. The Association of State and Territorial Health Officials recommends the following disaster preparedness planning efforts: define special needs communities in advance; conduct pre-event planning with community partners; coordinate with agencies caring for patients with special needs; incorporate special needs populations in emergency management plans and exercise those plans; prepare educational materials; identify available resources to support the shelter; and design plans to allow for maximum flexibility (Association of State and Territorial Health Officials, 2004b).

Special needs shelters were identified as a crucial public service provided during Hurricanes Charley, Frances, Ivan, and Jeanne, and should be included in public health preparedness planning. State and local disaster plans could be strengthened by addressing their abilities to rapidly establish and maintain these shelters in an emergency. The provision of special needs shelters reduces surge demands on hospitals where, in times of emergencies, services and care are demanded by other patients. Ultimately, these coordinated efforts allow for resources to be allocated and maximized during an event, allowing response efforts to be concentrated elsewhere (Association of State and Territorial Health Officials, 2004b).

Studies and experiences in recent MCEs indicate the necessity of improved planning that addresses the communication, support, and healthcare requirements of individuals with special needs. HRSA should work with states and nursing organizations to ensure surge emergency planning addresses the needs of special populations. Vital factors to consider include identification, medical records, access to medications and special diet requirements, loss of durable medical equipment, rejection from shelters, identification of and transportation of needed equipment, other vital articles required by the patient or evacuee, the need to secure appropriate transportation, and the importance of communication with and separation from care providers and community support systems (Cameron, 2006).

5.2. Surge Capacity for Different Settings

Rural Areas

A recent survey of states' offices of rural health found that rural jurisdictions and agencies are confronted with unique challenges in emergency preparedness (Health Resources and Services Administration, Office of Rural Health Policy, 2002). Rural facilities such as farms are vulnerable to bioterrorism attacks; nuclear power facilities, usually located in rural areas, may be targets for explosions. Yet compared with urban or suburban areas, rural readiness for emergencies is undermined by limited public health capacity and emergency response resources.

A report from HRSA's Office of Rural Health Policy (2002) cites many reasons why rural areas are disadvantaged with respect to surge capacity and preparedness for wide-scale health emergencies. A substantial number of rural hospitals lack surge capacity for beds and personnel. Many local health

departments do not provide hazardous materials handling services or emergency response activities. At the time of this report, only 20 percent of the 3,000 local health departments had developed a plan to deal with incidents of bioterrorism. The shortage of nurses and physicians in rural areas further compromises the preparedness of rural healthcare systems for potential disasters. In addition, rural areas may lack reliable Internet connectivity and rapid means for communication. Furthermore, on-site training and practice drills are rare in rural locations (Health Resources and Services Administration, Office of Rural Health Policy, 2002).

A statewide needs assessment in Kansas revealed that while response plans frequently existed at healthcare facilities, many staff were unaware of the location or content of the plans and had not participated in practice drills. Staff were concerned by the lack of support by institutions and administrators, the lack of interagency communication, and the absence of concise and accessible terrorism response materials (Ablah et al., 2005).

A nationwide survey of 941 emergency department nurse managers examined the threat preparedness levels of rural hospital emergency departments (Manley et al., 2006). The survey findings showed a majority (95 percent) of respondents said that it would take 10 or fewer patients needing simultaneous treatment to overwhelm their emergency department resources. Over one third (37 percent) reported that a significant incident had overwhelmed their emergency department at least once in the past 2 years. Over half (55 percent) said their hospital disaster plan had been invoked in that time period. The authors concluded that isolated rural hospitals need to concentrate on common elements that enhance their response to any disaster, including communication, command and control, and interagency cooperation. They must also address new strategies for surge capacity such as use of computer-based simulation to evaluate their readiness to respond to disasters and address bottlenecks that restrict surge capacity, and community-wide responses that involve EMS, public health, other hospitals, local practitioners, and local, state, and Federal response personnel (Manley et al., 2006).

Despite the fact that EMS personnel are likely to be first medical responders to mass-casualty events, many rural EMS organizations are ill-prepared for threats such as incidents involving weapons of mass destruction and natural disasters. Rural EMS respondents to a survey of 768 EMS organizations throughout the U.S. reported little experience with widespread disasters and limited capacities to manage even small MCEs (Furbee et al., 2006). Such events would severely aggravate an already challenging situation in rural areas struggling with existing personnel shortages and high turnover. The study showed that 70 percent of respondents said it would only take five or fewer critically ill or injured patients requiring simultaneous care to overwhelm their system. Only 3 percent of survey respondents reported that they had the capacity to handle 25 patients at one time.

To help ensure preparedness in the event of a disaster in rural areas, a comprehensive approach to address preparedness in rural communities should be developed and disseminated nationwide. That approach should include elements such as preparedness benchmarks and assessments; strategies to maintain adequate training levels; development and dissemination of best practices for rural healthcare preparedness; and region-wide response for rural communities including hospitals, public health, EMS, community providers, and federal response personnel (Furbee et al., 2006).

Schools

Schools are places of frequent mass gatherings and thus may be terrorist targets. Children who attend schools represent a vulnerable population and need special guidance and protection. Therefore, schools require specific planning for response during emergency situations. For example, young children have

increased susceptibility to chemical agents and increased propensity to dehydrate (Graham, Shirm, Liggin, Aitken, & Dick, 2006).

In a 2005 article on the disaster preparedness training needs of school nurses, Mosca, Sweeney, Hazy, and Brenner (2005) state,

> Meeting the complex needs of a school system and all its members in the event of a bioterrorism disaster demands a competent workforce. School nurses are in position to be key contributors to planning for and responding to potential bioterrorism and disaster events (p. S38).

However, a survey of 230 school nurses in rural New Mexico (Sapien & Allen, 2001) indicated that while 67 percent of the schools had activated EMS in the past year for a life-threatening student emergency, little emergency training existed for school nurses or staff and there was limited basic emergency equipment such as oral airways and oxygen. Only one quarter of these schools had a school nurse present on the campus at all times. Schools located in smaller communities were more likely to have this basic emergency equipment available since they were located further away from hospitals and therefore expected to be more self-sufficient. The authors emphasized that there was substantial variation in school disaster preparedness plans and EMS response time.

> "An essential role of the school nurse is to be prepared for emergencies, yet very few have specialized training in pediatric emergency care beyond Basic Life Support."
>
> (Elgie, Sapien, & Fullerton-Gleason, 2005, p. 19)

Elgie, Sapien, and Fullerton-Gleason (2005) described an emergency preparedness course for school nurses using on-site mock emergency scenarios to both train and evaluate nurses in responding to various types of emergencies in the school setting. An assessment of the New Mexico School Nurse and Emergency Medical Services Emergency Preparedness course (NM-SNEMS) demonstrated participating nurses had improved confidence, knowledge, and application of knowledge in simulated emergencies.

Mosca and colleagues (2005) examined the bioterrorism and disaster preparedness training needs of 80 school nurses in three Ohio counties. The survey findings demonstrated that only 7 percent of these school nurses were aware of the school district's plan for long-term recovery. Only 11 percent had worked with others in the district in bioterrorism and disaster preparedness planning and evaluation. About 60 percent of the respondents reported little or no confidence in their ability to implement many skills required for bioterrorism and disaster competency.

Olympia, Wan, and Avner (2005) surveyed 573 members of the National Association of School Nurses to examine the preparedness of schools to respond to life-threatening pediatric emergencies and mass disasters. Despite reported compliance with many emergency preparedness recommendations by the American Academy of Pediatrics and the American Heart Association, the authors concluded several areas must be addressed and improved, including practice in emergency response plans, direct links with EMS and identification of authorized personnel to make emergency decisions, increased availability of emergency equipment such as automated external defibrillators (AEDs), the presence of a full time nurse throughout the day, and increased education of school nurses in the assessment and management of pediatric emergencies.

Graham and colleagues (2006) found major deficiencies in school emergency and disaster planning in a mail survey sent to 3,670 randomly selected school superintendents in the United States. The evaluators found that while 58 percent of the 2,137 respondents had a response plan, just over half had a plan for prevention and less than one third had ever conducted an evacuation plan drill. Almost one quarter of respondents had no disaster plan provisions for children with special healthcare needs. Almost half of the respondents had never met with local ambulance officials to coordinate local emergency plans. The authors conclude that "the concept of school health must now be broadened to include preparedness for a mass-casualty event" (p. 14) and requires the collaboration of pediatricians, local school officials, school nurses, physicians, public health officials, and local emergency officials (Graham et al., 2006).

5.3. Summary

Addressing special needs populations in a time of crisis will require planners to anticipate healthcare needs and resource shortfalls. HRSA should work with states and nursing organizations to ensure surge emergency planning addresses the needs of special populations. It will be necessary to develop public health emergency response plans that consider vulnerable populations to meet the needs of infants, children, elderly individuals, pregnant women, those with disabilities or mental illnesses, and people with chronic health conditions.

Recommendations

The National Advisory Council on Nurse Education and Practice (NACNEP) recommends that HRSA support key nursing education-related efforts. These include support for initiatives to integrate surge care-related coursework into curricula and support for efforts to identify and train a supplemental workforce to provide healthcare during surge emergencies. In addition, the NACNEP recommends that DHHS should continue to support programs that increase the capacity of nursing education and increase nurse supply so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the surge emergency. Finally, the NACNEP recommends that HRSA continue to support initiatives to help ensure that nursing-related workforce information systems, such as volunteer databases, are accurate, compatible, and accessible through a variety of systems and devices. The specific recommendations are provided below.

1. State Boards of Nursing should support initiatives to develop or modify existing plans in regard to national nursing standards of care for triage and ongoing patient management during surge events. In times of emergency, it may be desirable for Boards of Nursing to have flexibility in granting temporary certification or licenses for nurses who are inactive, retired, or licensed in another state. It also may be desirable on a temporary and emergency basis to grant permission to certain professionals to function outside their legal scope of practice, such as allowing nurses to diagnose patients and write medical orders. National nursing standards of care must address clinical, legal, and ethical issues that nurses may encounter in large-scale emergencies and encourage the appropriate use of interdisciplinary teams and collaboration.

The Department of Health and Human Services (DHHS) should:

2. Work with the Department of Homeland Security (DHS), states, and nursing organizations to build surge emergency planning into existing practice at national, state, local, and facility levels. Planning should address nursing-specific issues related to movement of nurses across states, mode of response (volunteer vs. registry), licensing, credentialing, communication, security issues to ensure the protection of nurses from any unlawful behavior of the public, and the needs of special populations (e.g., people with disabilities, elderly individuals, rural populations).

3. Support existing recruitment and retention programs to increase the capacity of nursing education and increase nurse supply so that when surge events occur, the supply of nurses is adequate to provide the additional short term workforce needed to respond to the public health emergency. Given the current nursing shortage and prospects for the shortage worsening, it is essential that surge-related initiatives do not dilute or remove focus from existing recruitment and retention initiatives.

4. Support an initiative to encourage nurses to promote the development of individual/family disaster plans and educate the public about how to handle medical emergencies in a crisis. It is important for all public health workers who would be called upon in an emergency to have plans in place for their own families so they can provide help to the public.

5. Support initiatives to help ensure that nursing-related workforce information systems, such as volunteer databases, are accurate, compatible, and accessible through a variety of systems

and devices. Information systems and databases must be up-to-date, interoperable, and accessible via multiple methods in order to be most efficient and useable in an emergency.

6. Provide funding for an independent evaluation of programs that are intended to improve nurse preparation for public health emergencies. This evaluation should assess which programs work best and why, and then disseminate findings from the evaluations.

7. Support initiatives to integrate public health emergency or disaster care-related coursework into curricula for nursing programs. Initiatives should address faculty development and encourage accrediting organizations to consider including emergency preparedness concepts in their standards.

8. Provide funding to support the development and implementation of continuing education on nursing care during public health emergencies. Continuing education should be designed for nurses and educators, include Web-based training, and be applicable to practicing nurses as well as those not active in the clinical workforce.

9. Identify and train a supplemental workforce (e.g., retired nurses, inactive nurses, faculty in schools of nursing, other healthcare professionals who can be cross-trained) to provide healthcare during surge emergencies. With the current nursing shortage, meeting surge capacity needs would be especially difficult without additional labor provided by a supplemental workforce.

10. The United States Congress should commission a study to identify nursing-related lessons learned from surge events like Hurricane Katrina. While the experiences and accounts of nurses who have provided services in recent disasters has been helpful, a formal study is needed to identify the lessons that have been learned. Such a study would provide an effective way to gather those lessons and disseminate them to a broader audience and thereby improve the response of the healthcare system in the event of a mass casualty event in the future.

Topic 2 – Information Technology in Nursing Education and Practice

Members of the 116th Meeting of the National Advisory Council on Nurse Education and Practice
April 2007

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Abstract

Information Technology has been used to improve effectiveness and efficiency in many sectors of society. Financial services, government, manufacturing, and education have all taken advantage of Information Technology (IT) advances to improve results. Similar opportunities exist for healthcare. In addition to benefits for individual patients such as improved quality of care, reduced medical errors, a reduction in duplicate treatments and tests, and lowered costs, healthcare IT can provide broader benefits for the overall healthcare system. These significant benefits include early detection of infectious disease outbreaks around the country, improved tracking of chronic disease management, and the ability to gather de-identified data for research purposes.

However, despite these opportunities, many components of the nation's healthcare delivery system use technology that has been in place for the past century. Given the existing nurse shortage and the growing complexity and requirements of healthcare delivery, the current approach to information management is becoming increasingly inadequate. Several initiatives have been put in place by the Federal government to help take advantage of the opportunities that IT can provide, facilitate adoption of IT in healthcare, and address concerns such as interoperability, privacy, and security.

To help ensure that practicing nurses, nurse educators, and students are best positioned to operate in an increasing information technology-rich environment, the National Advisory Council on Nurse Education and Practice (NACNEP) reviewed two aspects of the use of technology in nursing at its 116th meeting in April 2007. First, the National Advisory Council on Nurse Education and Practice examined the use of healthcare IT and informatics in nursing practice. Second, the National Advisory Council on Nurse Education and Practice assessed the use of IT in nursing education, and incorporation of healthcare IT training, informatics, and technology tools into curricula. After examination of current status, opportunities, and challenges, the National Advisory Council on Nurse Education and Practice developed a set of recommendations that are put forward in this report.

Executive Summary

The recent Information Technology (IT) revolution has had a significant effect on how activities are performed in many sectors of our society. Financial services, government, manufacturing, and education have all taken advantage of IT in order to improve effectiveness and efficiency. Similar opportunities for improvement exist for healthcare. In addition to benefits for individual patients such as improved quality of care, reduced medical errors, a reduction in duplicate treatments and tests, and lowered costs, healthcare IT can provide broader benefits for the overall healthcare system. These significant benefits include early detection of infectious disease outbreaks around the country, improved tracking of chronic disease management, and the ability to gather de-identified data for research purposes.

Many of these opportunities are thus far unrealized as much of the nation's healthcare delivery system uses outdated systems that have been in place for the past century. Pencils and paper are still used for many activities like monitoring patient information, ordering prescriptions, scheduling the nurse workforce, and maintaining patient records. Given the existing nurse shortage and the growing complexity and requirements of healthcare delivery, this approach to information management is becoming increasingly inadequate.

> "Integrating Information Technology (IT) into nursing education and practice has the potential to improve healthcare quality, prevent medical errors, reduce healthcare costs, increase administrative efficiencies, decrease paperwork, and expand access to affordable care.
>
> "In particular, interoperable IT has great potential to improve patient care through early detection of disease outbreaks, improved tracking of chronic disease management, and evaluation of healthcare based on value, which is enabled by the collection and comparison of de-identified price and quality information."
>
> (Debisette, 2007)

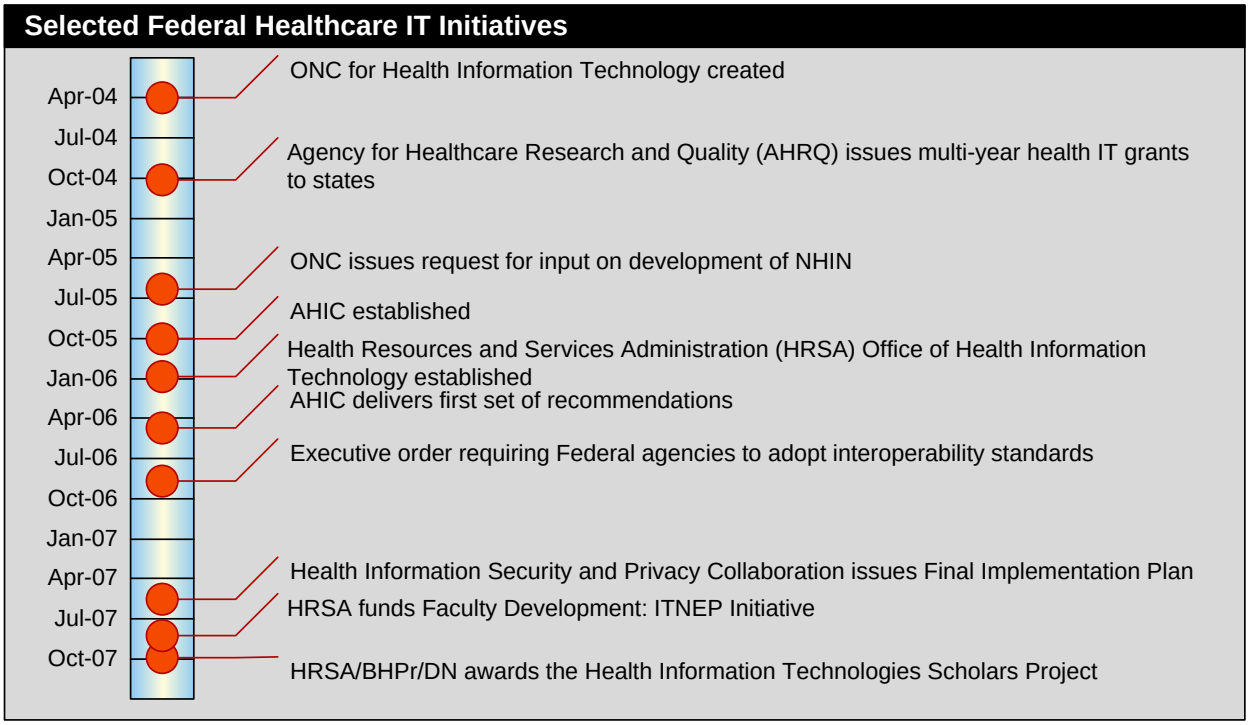
To help ensure that practicing nurses, nurse educators, and students are best positioned to operate in an increasing information technology-rich environment, the National Advisory Council on Nurse Education and Practice (NACNEP) reviewed two aspects of the use of technology in nursing at its 116th meeting in April 2007. First, the NACNEP examined the use of healthcare IT and informatics in nursing practice. Second, the NACNEP assessed the use of IT in delivering nursing education, and incorporation of healthcare IT and informatics in curricula. After examination of current status, opportunities, and challenges, the NACNEP developed a set of recommendations that are put forward in this report.

Federal Initiatives

The growth of healthcare IT has been fueled by several factors including increased emphasis on ensuring patient safety and preventing medical errors. This growth has also been facilitated by a number of Federal initiatives. These include the Office of the National Coordinator for Health Information Technology (ONC), the American Health Information Community (AHIC), the Nationwide Health Information Network (NHIN), the Faculty Development: Integrated Technology into Nursing Education and Practice Initiative (ITNEP), and others. These initiatives have helped to facilitate healthcare IT

adoption and help to make certain that concerns such as interoperability, privacy, and security are addressed.

Figure 2 – Selected Federal Healthcare IT Initiatives



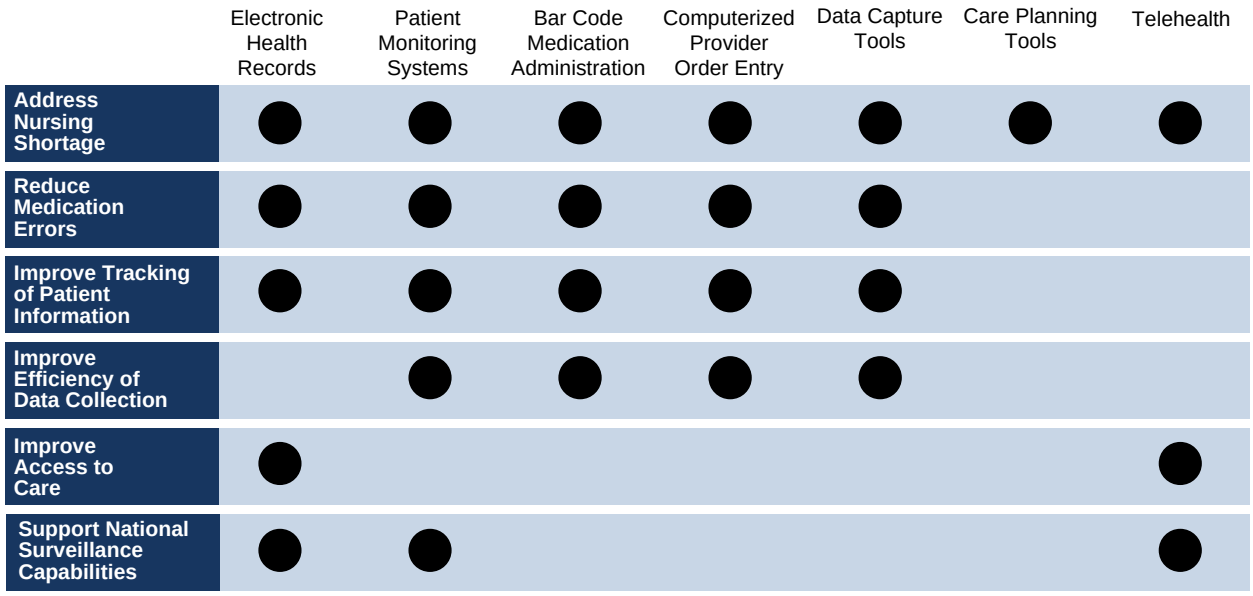
Integration of Healthcare IT in Nursing Practice

Healthcare IT can contribute to meeting a range of challenges in nursing including addressing the nurse workforce shortage, reducing medical errors, improving monitoring and tracking of patient health information, improving efficiency and accuracy of data collection, enhancing efficiency of administrative tasks, and increasing access to care. In addition, healthcare IT can be part of establishing national surveillance capabilities to enable a more effective response in the event of a public health emergency such as a pandemic infectious disease outbreak. A variety of technologies can be part of the solution for addressing these challenges. Among these tools and technologies are Electronic Health Records (EHRs), Bar Code Medication Administration (BCMA), Computerized Provider Order Entry (CPOE) with Decision Support Systems (DSS), data capture, care planning tools, Clinical Decision Support Systems (CDSSs), and telehealth.

Recent research has shown positive outcomes associated with various health information technologies. For example, in a study to measure the impact of a CDSS for use in medication administration, Mullett, Evans, Christenson, and Dean (2001) reported a 59 percent decrease in pharmacist intervention for erroneous drug doses. There is also evidence that tools for structured data collection and documentation can bring about more complete and consistent documentation of patient data (Margolis et al., 1992, Carroll, Saluja, & Tarczy-Hornoch, 2001). Studies indicate that EHRs can improve the quality of patient care by facilitating the storage of accurate data, making data readily accessible, and putting data into context-specific information that empowers providers. Electronic charting and features for

detecting and reporting adverse drug events (ADEs) were among the features of the EHR that were found to provide the significant benefit in an AHRQ study (Agency for Healthcare Research and Quality, 2006). Key nursing practice challenges and related technology solutions are set out in the chart below.

Figure 3 - Information Technology to Address Nursing Practice Challenges



Address the nursing shortage: The shortage of nurses in the United States is projected to grow to 800,000 vacancies by 2020 (Health Resources and Services Administration, Bureau of Health Professions, July 2002). A range of technologies can help address this challenge by improving the work environment, which can increase retention, and by improving productivity of nurses.

Reduce medication errors: Medication errors are among the most common healthcare errors. Preventable prescription drug errors cause 1.5 million injuries per year, including 400,000 a year in U.S. hospitals. Technology such as Clinical Decision Support Systems (CDSSs), which provide information on drug compatibility or contraindications, can help to alleviate such errors.

Improve monitoring and tracking of patient health information: EHR systems with patient monitoring capabilities can improve patient outcomes.

Improve efficiency and accuracy of data collection: In delivering patient care, nurses must manage a great deal of information. For example, nurses routinely spend 15-25 percent of their workday documenting patient care (Gugerty et al., 2007). Technology such as CDSSs can help reduce the documentation of redundant information.

Improve efficiency of administrative tasks: As a result of the complexities of the current healthcare environment with multiple care providers and payers, today's nurse faces increasing amounts of paperwork that impact the amount of time available to spend directly caring for patients. However, data capture information technologies such as electronic charting (Day, Hoang, Ouk, Nagda, & Schriger,

1995) and CPOE can help improve efficiency and effectiveness and enhance patient outcomes (Johnston, Pan, Middleton, Walker, & Bates, 2003).

Improving access to care: Obtaining access to a healthcare provider can be challenging for those who live in rural areas or otherwise have difficulty traveling to a provider. Telehealth applications that bridge distances between patients and care providers facilitate monitoring and communication.

Establishing national surveillance capabilities: As discussed in Surge Capacity: Educating the Nursing Workforce for Emergency and Disease Preparedness (Part 1 of this report), the potential for a pandemic outbreak or a bioterrorism attack is a concern among healthcare policymakers and the general public. Interoperable healthcare IT can facilitate the development of capabilities for early detection of disease outbreaks, improved tracking of chronic disease management, and evaluation of healthcare delivery and assessment of disparities across populations.

Challenges in Integrating Healthcare IT into Practice

Despite the potential benefits of healthcare IT, investment and adoption has been limited, particularly among small-scale providers and those in rural areas who are most affected by the financial costs of implementation. In 2005, only about 20–25 percent of hospitals and 15–20 percent of physicians' offices had a healthcare IT system (RAND Corporation, 2005). Establishing effective healthcare IT in clinical settings presents many challenges, including the high cost of purchasing and installing a system, the high cost and limited availability of healthcare IT expertise, the importance of understanding the changing marketplace for healthcare IT vendors, and the difficulty of implementing the system while still providing care to patients (Hansen-Turton, 2007). RAND Corporation (2005) researchers estimated that widespread implementation of healthcare IT would cost around $8 billion per year, assuming adoption by 90 percent of hospitals and doctors' offices over 15 years.

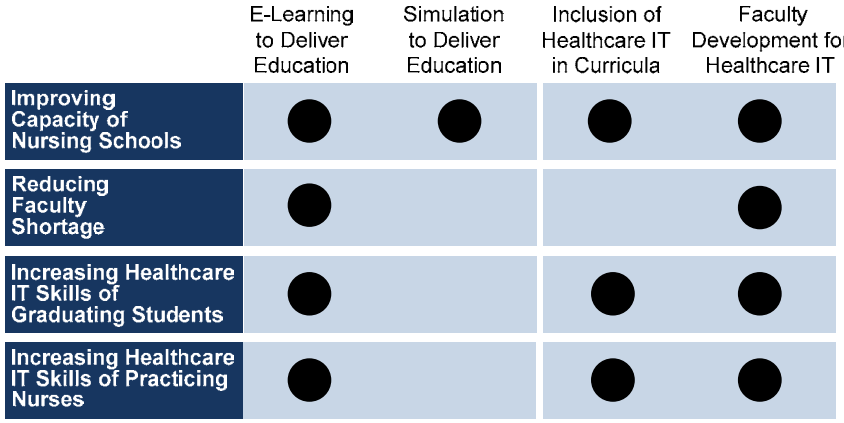
To deliver effective evidence-based practice supported by healthcare IT, the nurse workforce needs the proper healthcare IT competencies, including information literacy and access to research information. Without proper training of nurses, efforts to integrate healthcare IT with nursing practice will be hampered. There is evidence that nurses are not getting adequate training to participate in IT integration or usage.

Use of Technology in Nursing Education and Incorporation of Healthcare IT into Nursing Curricula

Use of technology is one of the solutions for a range of challenges in nursing education including improving capacity at nursing schools, reducing the faculty shortage, increasing healthcare IT and informatics skills of graduating student nurses, and increasing healthcare IT and informatics skills of practicing nurses. Technology can be used to address some of these challenges through tools such as e-learning and human performance simulators.

In addition, as IT is increasingly adopted into the healthcare practice environment, it is vital that nurses are equipped with the knowledge and skills to use that technology through preparation in nursing school and continuing education. In order to achieve this broadly skilled workforce, it is necessary to include more healthcare IT topics in nursing curricula and develop more faculty capable of teaching healthcare IT and informatics skills. Key nursing education challenges and related technology solutions are set out in the chart below.

Figure 4 - IT Solutions for Nursing Education Challenges



Improve capacity of nursing schools: One of the key factors contributing to the nursing shortage is the limited teaching capacity in nursing schools. Using technology such as e-learning can improve institutions' abilities to leverage those resources and expand teaching capacity.

Reduce faculty shortage: The faculty shortage is a key factor in nursing school capacity constraints. Initiatives for faculty development and e-learning can reduce the impact of this shortage.

Increase healthcare IT skills of graduating students: Core informatics knowledge and healthcare IT competencies are essential for all nurses to function effectively in the current healthcare environment. Inclusion of healthcare IT topics in curricula, along with more faculty trained in healthcare IT and informatics, can address this challenge.

Increase healthcare IT skills of practicing nurses: Continuing education is required to train practicing nurses in healthcare IT and informatics competencies.

Challenges in Using Technology in Education and Integrating Healthcare IT into Curricula

There are challenges and constraints to integrating technology into nursing education and including healthcare IT and informatics into nursing curricula. One of the key constraints is a shortage of faculty and other resources. There are significant upfront costs for developing and delivering curricula that teach informatics skills. Many schools lack the resources needed to incorporate informatics skills into their educational programs.

Recommendations

The National Advisory Council on Nurse Education and Practice reviewed the challenges described above at its 116th meeting in April 2007 and developed a set of recommendations that are put forward in this report. The following recommendations are directed to the Department of Health and Human Services and the United States Congress:

1. Involve nurses in the planning and design process for healthcare IT at the local, state, and Federal levels. Nurses are the largest group of users of healthcare IT systems in most healthcare

settings. Greater nurse input to the design, customization, and implementation of the systems may increase nurses' use of the technology, as well as produce systems that improve quality of care because they are more responsive to nurses' needs.

2. Support initiatives to prepare more nursing informatics specialists. Nurse informaticists can play a leadership role in representing nursing in IT planning and integration of IT and informatics into nursing practice.

3. Support the creation and development of public/private partnerships to improve adoption of healthcare IT and informatics in practice. These partnerships will help address constraints such as lack of available faculty and other resources for integration of technology into nursing curricula and teaching methods.

4. Support the use of IT and technology tools in education; support the incorporation of healthcare IT and informatics into curricula and the evaluation of educational outcomes. Technology tools in education can help to improve capacity of nursing schools. Incorporation of healthcare IT into curricula can increase the healthcare IT skills of graduating students. The development of health informatics curricula will be essential for the widespread adoption and effective use of healthcare IT to improve patient outcome.

5. Support research and demonstration projects to assess the impact of various technologies such as e-learning and simulations on student learning, capacity to educate additional students, faculty workload, and patient outcomes. There has been limited research on the effectiveness of simulation learning activities as teaching tools. While studies show positive results from implementation of technology, such as simulations in education, more research is needed to determine how best to deploy these technologies.

6. Provide more Federal funding for capacity building (e.g., faculty development) in teaching about health information technologies or informatics and teaching with technology. There is an inadequate number of nursing education faculty members qualified to teach informatics and use technology teaching tools. Improving capacity in this area would improve student success and help address the faculty shortage.

7. Facilitate dissemination of best practices for integration of healthcare IT and associated training and systems implementation in nursing practice. Technology is being implemented at the local level by a number of organizations. To help ensure that such efforts are being implemented using best practices, and in a way that optimizes interoperability, efforts should be funded to identify and create linkages and to disseminate best practices.

8. Increase Federal funding grants to help colleges and universities incorporate technologies such as e-learning and simulation training in order to allow place-bound and working nurses access to baccalaureate and graduate nursing education, and continuing education. To deliver effective evidence-based practice supported by healthcare IT, the nurse workforce needs the proper healthcare IT competencies, including information literacy, and access to research information.

1. Introduction: Opportunities for Technology in Nursing

Evidence of recent advances in Information Technology (IT), such as high-speed computer networks, personal computers, and enterprise software, exist everywhere. Financial services, government, manufacturing, and education have all leveraged IT to improve results; similar opportunities exist for healthcare. Healthcare IT systems like patient monitoring systems, barcode medication administration, and Computerized Provider Order Entry (CPOE) systems can provide significant benefits both in nursing practice and nursing education. In nursing practice, for example, IT tools and systems that store, protect, retrieve, and transfer clinical, administrative, and financial information electronically (Health Resources and Services Administration, n.d.-a) can yield higher quality care, fewer medical errors, a reduction in duplicate treatments and tests, lowered healthcare costs, and improved access to healthcare information. Electronic Health Records (EHRs), which provide caregivers timely access to patient health information, could save up to $81 billion in healthcare costs annually, while improving healthcare quality, increasing patient safety, and increasing operational efficiency (Hillestad et al., 2005). For the overall healthcare system, advantages of utilizing healthcare IT include early detection of infectious disease outbreaks around the country, improved tracking of chronic disease management, the ability to gather de-identified data for research purposes, and evaluation of healthcare based on value, enabled by the collection of price and quality information that can be compared (Agency for Healthcare Research and Quality, 2007).

> "Integrating Information Technology (IT) into nursing education and practice has the potential to improve healthcare quality, prevent medical errors, reduce healthcare costs, increase administrative efficiencies, decrease paperwork, and expand access to affordable care.
>
> "In particular, interoperable IT has great potential to improve patient care through early detection of disease outbreaks, improved tracking of chronic disease management, and evaluation of healthcare based on value, which is enabled by the collection and comparison of de-identified price and quality information."
>
> (Debisette, 2007)

Despite advances in IT related to healthcare in recent years, many components of the nation's healthcare delivery system use outdated systems that have been in place for the past century. Pencils and paper are still used for many activities like monitoring patient information, ordering prescriptions, scheduling the nurse workforce, and maintaining patient records. Given the existing nurse shortage and the growing complexity and requirements of healthcare delivery, this approach to information management is becoming increasingly inadequate.

Healthcare IT and informatics are among the solutions for addressing key challenges. The American Nurses Association (ANA) (2008) defines informatics as follows:

> Nursing informatics (NI) integrates nursing science, computer and information science, and cognitive science to manage, communicate, and expand the data, information, knowledge, and wisdom of nursing practice.

Nurses trained in NI support improved patient outcomes through their expertise in information processes, structures, and technologies, thus helping nurses and other care providers to create and record the evidence of their practice.

To help ensure that practicing nurses, nurse educators, and students are best positioned to operate in an increasing information technology-rich environment, the National Advisory Council on Nurse Education and Practice (NACNEP) reviewed two aspects of the use of technology in nursing at its 116th meeting in April 2007. First, the NACNEP examined the use of healthcare IT and informatics in nursing practice. Second, the NACNEP assessed the use of IT in delivering nursing education and incorporation of healthcare IT and informatics in curricula. After examination of the current status, opportunities, and challenges, the NACNEP developed a set of recommendations that are put forward in this report.

> "...the most remarkable feature of this twenty-first century medicine is that we hold it together with nineteenth-century paperwork. This is just inexcusable. And it has to change."
>
> (Thompson, 2004, para. 3)

1.1. Opportunities to Address Nursing Challenges

Clinical Challenges Technology Can Help Address

Healthcare IT can be part of the solution for addressing a number of practice-related challenges in nursing. Healthcare IT can address the nurse shortage, reduce medical errors, improve monitoring and tracking of patient health information, improve efficiency and accuracy of data collection, enhance efficiency of administrative tasks, and increase access to care. Despite the potential benefits of healthcare IT, investment and adoption has been limited, particularly among smaller providers who are most affected by the financial costs of implementation. Financial, educational, and technical barriers inhibit widespread adoption.

Education-Related Challenges Technology Can Help Address

Technology may help solve some of the challenges in nursing education, including improving capacity at nursing schools, reducing the faculty shortage, increasing healthcare IT and informatics skills of graduating student nurses, and increasing healthcare IT and informatics skills of practicing nurses. Technology can be used to address some of these challenges through tools such as e-learning and human performance simulators.

In addition, as IT is increasingly adopted into the healthcare practice environment, it is vital that nurses are equipped with the knowledge and skills to use that technology through preparation in nursing school and continuing education. In order to achieve a workforce with these skills, it is necessary to include more healthcare IT topics in curricula and develop more faculty capable of teaching healthcare IT and informatics skills.

There are challenges and constraints to integrating technology into nursing education and including healthcare IT and informatics into nursing curricula. One of the key constraints is a shortage of faculty and other resources. There are significant upfront costs for developing and delivering curricula that teach informatics skills. Many schools lack the resources needed to incorporate informatics skills into their educational programs.

1.2. Evidence of Benefits for Technology in Healthcare

There are several research studies indicating beneficial outcomes associated with various health information technologies. For example, in a study to measure the impact of Clinical Decision Support Systems (CDSSs) for use in medication administration, Mullett, Evans, Christenson, and Dean (2001) reported a 59 percent decrease in pharmacist intervention for erroneous drug doses. There is also evidence that tools for structured data collection and documentation can bring about more complete and consistent documentation of patient data (Margolis et al., 1992, Carroll, Saluja, & Tarczy-Hornoch, 2001).

Studies indicate that EHRs can improve quality of patient care by facilitating the storage of accurate data, making data readily accessible, and putting data into context-specific information that empowers providers. Electronic charting and features for detecting and reporting adverse drug events (ADEs) were among the features of EHRs that were found to provide the greatest benefit (Agency for Healthcare Research and Quality, 2006). A study of 100 nursing personnel at a large Magnet hospital in Southwest Florida found that 75 percent of nurses felt EHRs had improved the quality of documentation and 76 percent believed electronic charting would lead to improved safety and patient care (Moody, Slocumb, Berg, & Jackson, 2004).

" 'Telehealth technology has enormous opportunity to increase quality while lowering the overall cost of care,' said Joseph C. Kvedar, MD, director of the Center for Connected Health, a division of Partners HealthCare... 'As the fees for face-to-face provider services continue to increase, the cost-benefit picture of telehealth improves – while bringing care to patients where they are and when they need it.'

'On the national level, the value of provider-to-provider telehealth technologies has broad social implications for improving access to primary and specialty medical care for all patients, but particularly for those who live in geographically underserved locations,' said Blackford Middleton, MD, chairman of CITL. 'With telehealth tools, providers can responsibly treat patients' health conditions before they become critical and manage chronic conditions before they lead to serious complications.' "

(The Center for Information Technology Leadership, 2007, p. 3)

Another study noted a 30 percent decline in the occurrence of pressure ulcers after implementing documentation IT at four nursing homes (Wicklund, 2007). In 2007, the Center for Information Technology Leadership (CITL) with support from the Robert Wood Johnson Foundation and InterSystems, researched the benefits, costs, and quality implications of IT-enabled diabetes management programs (ITDM) in the U.S. The resulting report, "The Value of Information Technology-Enabled Diabetes Management," indicated that implementing IT strategies to manage diabetes and keep better track of patients could save thousands of lives. CITL's research indicates that ITDM could avoid millions of cases of diabetes complications, such as kidney

failure, stroke, heart attacks, and blindness. In addition, the technology could improve compliance with standards of care, from the current rate of less than 50 percent to as high as 80 percent; may save money in select cases; and save hundreds of thousands of lives. Electronic diabetes registries used in physician offices could save a net of $14.5 billion in diabetes-related costs over 10 years (Cusack et al., 2007).

Several studies have reported benefits associated with technologies for telehealth. These technologies enable providers to consult with, evaluate, and monitor patients, all while working remotely. Gustke and colleagues (2000) conducted a study to evaluate patient satisfaction when telemedicine was used for clinical consultations. They found that overall patient satisfaction reported was 98 percent. Patients were highly satisfied with distance consultations through telemedicine, and reported that care was easier to obtain. Similar results were reported from a 2003–2004 study in which nurse practitioners who had received telemedicine training were located at rural hospitals and treated patients with the aid of a telemedicine link with physicians located at teaching hospitals. Of 242 patients surveyed who had received care through this approach, 97 percent of patients were comfortable or very comfortable with the system, 95 percent had no difficulty with seeing or hearing the physician, 98 percent said care was as good as care from a physician alone, 96 percent stated care was as good as from a physician in person, 97 percent rated the overall care as good or excellent, 92 percent said they would use the system again, and 85 percent expressed no concerns about privacy (Galli, Henderson, Rutledge, & Summers, 2004). Additional healthcare IT study findings provide some promising results, but more research is needed to better assess costs and implementation considerations in a wider variety of settings.

In 2007, CITL examined the value proposition for implementing a subset of telehealth technologies. The organization's report, "The Value of Provider-to-Provider Telehealth Technologies," found provider-to-provider telehealth technologies could save healthcare as much as $4.28 billion a year. The annual savings would be derived from the implementation of robust telehealth systems with a 5-year rollout in emergency departments, correctional institutions, nursing homes, and physician offices nationwide, according to the report. CITL examined the overall value of three telehealth technology systems – store-and-forward, real-time video, and a hybrid model that combines the first two – in those four settings. It recommends the hybrid model. By reducing face-to-face visits and redundant and unnecessary tests alone, researchers say the hybrid system can save $3.61 billion annually. With a 5-year rollout nationwide, researchers found implementation reaches a break-even point in year 5 (Bu et al., 2007).

> "Recent surveys have shown a rapid increase in the number of specialty and subspecialty areas that have successfully used telemedicine. Radiology continues to make the greatest use of telemedicine with thousands of images "read" by remote providers each year. Other major specialty areas include: dermatology, ophthalmology, mental health, cardiology, and pathology. According to reports and studies, almost 50 different medical subspecialties have successfully used telemedicine."
>
> (American Telemedicine Association, 2007, Telemedicine Services section)

A 2002 Veterans Health Administration (VHA) study of its home health project found that by monitoring specific health conditions and coordinating the patient's care, the VHA could reduce the number of emergency room visits by 40 percent, reduce hospital admissions by 63 percent, and reduce the number of days in the hospital by 60 percent. It also reduced the number of nursing home admissions by 64 percent with a reduction in the number of days of care in a nursing home by 88

percent, all while seeing a significant improvement in the quality-of-life measurement. Additional studies continue to validate the savings identified in the VHA study (Meyer, Kobb, & Ryan, 2002).

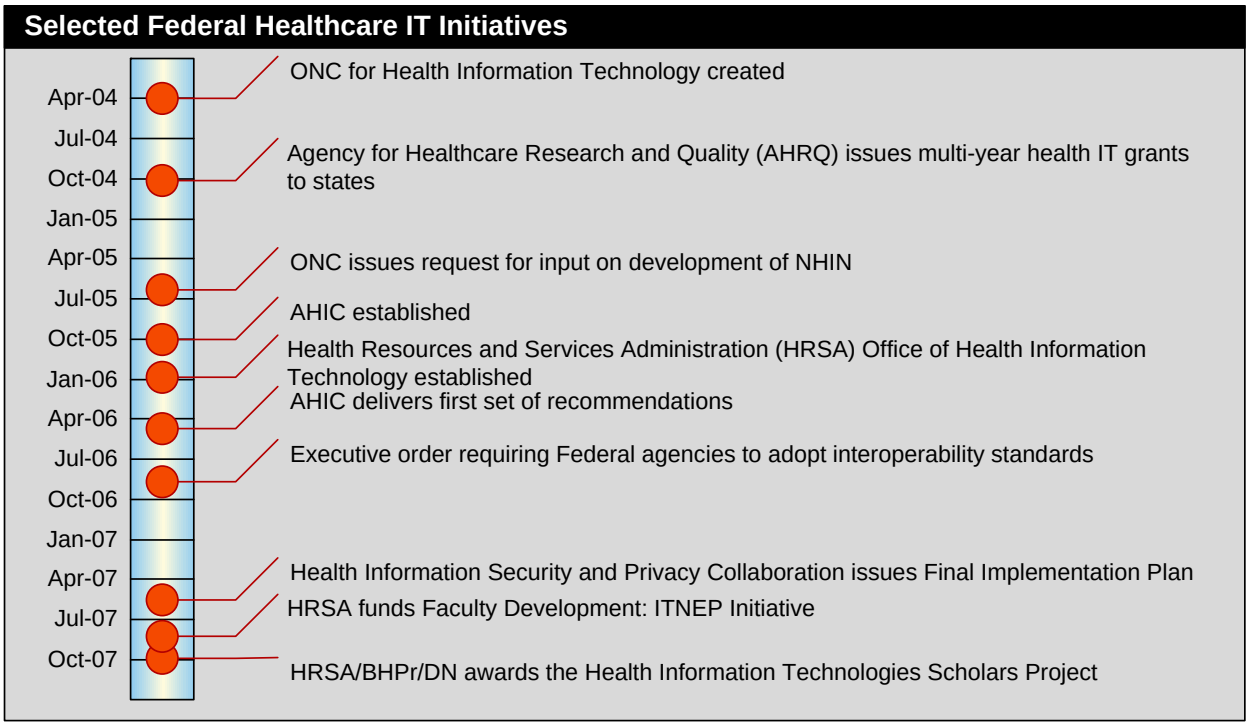
While such research provides beneficial findings from use of technology in healthcare, in some areas the research is limited. There remains a need for additional research with more generalizable results and more information on the costs of healthcare IT. The Federal government should provide more support for research and demonstration projects to assess the impact of healthcare IT on patient outcomes and nurse productivity. The NACNEP believes there remains a need for evaluation of healthcare IT innovations and assessment of best practices to ensure that benefits can be realized in a variety of settings.

1.3. Federal Initiatives Supporting Adoption of Healthcare IT

Secretary of Health and Human Services Tommy Thompson declared this "the decade of health information technology," establishing goals to transform the healthcare system by incorporating electronic health records into practice, interconnecting clinicians to information resources for decision making, personalizing health records for consumers, and collecting timely, accurate clinical information to improve population health (United States Department of Health and Human Services, 2004). In order to achieve these goals, several initiatives have been put in place by the Federal government. These include the Office of the National Coordinator for Health Information Technology (ONC), the American Health Information Community (AHIC), the Nationwide Health Information Network (NHIN), the Faculty Development: Integrated Technology into Nursing Education and Practice (ITNEP), and others.

These initiatives have helped to facilitate healthcare IT adoption and help to make certain that concerns such as interoperability, privacy, and security are addressed. The ONC provides counsel to the Secretary of the Department of Health and Human Services (DHHS) and departmental leadership for the development and nationwide implementation of an interoperable healthcare IT infrastructure. The ONC also provides management of and logistical support for the AHIC. The AHIC makes recommendations to the Secretary of DHHS on how to make health records electronic and interoperable, encourage market-led adoption, and ensure that the privacy and security of those records are protected at all times. The basic goals underlying these initiatives are spelled out in the president's vision put forward in 2004. The chart below sets out a timeline for selected key Federal healthcare IT initiatives.

Figure 5 - Selected Federal Healthcare IT Initiatives



In 2004, the President's Information Technology Advisory Committee (PITAC) recommended a framework for a 21st century health care information infrastructure that revolutionizes medical records systems. The four core elements of this framework are:

- EHRs for all Americans that provide every patient and his or her caregivers the necessary information required for optimal care while reducing costs and administrative overhead.
- Computer-assisted clinical decision support systems (CDSSs) to increase the ability of health care providers to take advantage of state-of-the-art medical knowledge as they make treatment decisions (enabling the practice of evidence-based medicine).
- Computerized provider order entry (CPOE) — such as for tests, medicine, and procedures — both for outpatient care and within the hospital environment.
- Secure, private, interoperable, electronic health information exchange, including both highly specific standards for capturing new data and tools for capturing non-standards-compliant electronic information from legacy systems.

2. Integration of Technology and Informatics in Nursing Practice

The growth of healthcare IT has been fueled by several factors including increased emphasis on ensuring patient safety and preventing medical errors. The development has also been facilitated by Federal initiatives including those discussed on Section 1.3. Existing research indicates the use of healthcare IT can reduce medical errors, improve efficiency, and improve quality and timeliness in other areas. For example, an Institute of Medicine (IOM) (2001) assessment concluded that telehealth, computerized reminder systems, and broader-based decision support systems can enhance clinician performance and improve patient care (Institute of Medicine, 2001).

While there are compelling benefits to be gained through increased adoption of healthcare IT, there are also significant barriers. These obstacles include cost, technical issues, system interoperability, concerns about privacy and confidentiality, and lack of a well-trained clinician informatics workforce to lead the process (Hersh, 2004).

The importance of a well-trained healthcare workforce cannot be overemphasized. In its report "Health Professions Education: A Bridge to Quality," the IOM acknowledged the increasing role of technology in the delivery of healthcare and recommended that all healthcare professionals have knowledge and skills in five areas: interdisciplinary collaboration, patient-centered care, evidence-based practice, quality improvement, and informatics (Institute of Medicine, 2003).

While healthcare professionals and organizations must be vigilant in protecting patient privacy, it is important to note that privacy issues exist whether the medical record is paper or electronic. In fact, the IOM reports that paper-based records are at least as insecure as electronic ones, and perhaps even less secure (Institute Of Medicine, 1997).

Nursing Informatics

"Nursing informatics (NI) integrates nursing science, computer and information science, and cognitive science to manage, communicate, and expand the data, information, knowledge, and wisdom of nursing practice."
(The American Nurses Association, 2008)

"Informatics serves as an infrastructure for evidence-based practice, quality improvement, patient-centered care, and even interdisciplinary collaboration… information technologies are key to the transformation of health care delivery, and informatics is an important component of all health professionals' education."
(Skiba, 2004, p. 312)

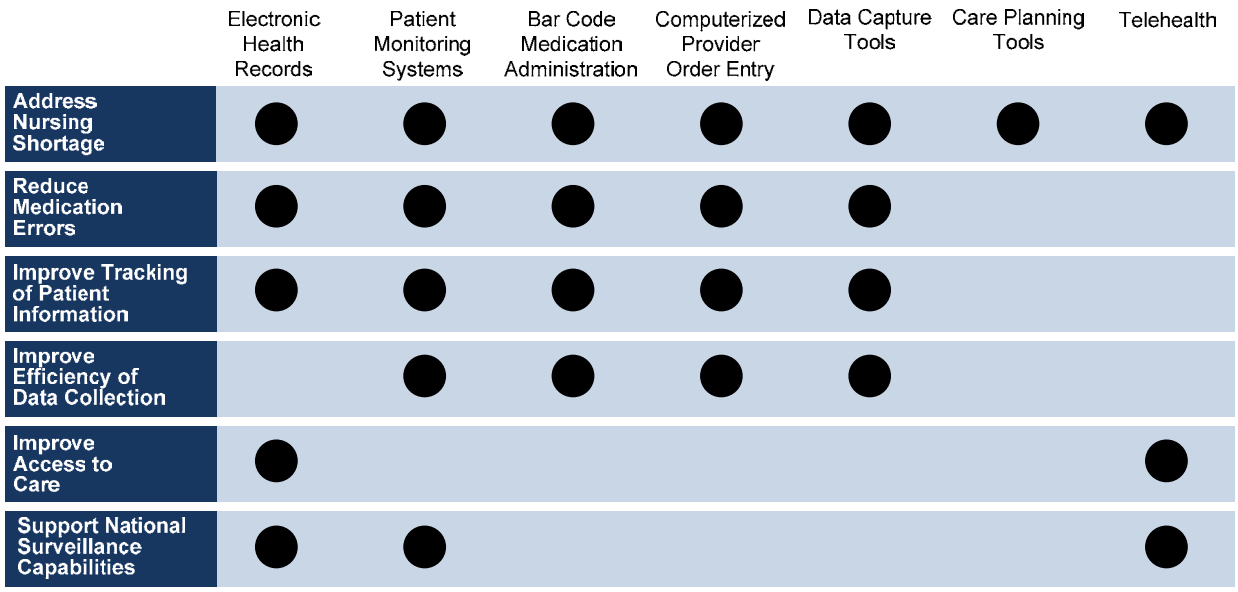
It is the vehicle that enables evidence of the effects of nursing interventions to be linked with the outcomes of care in relation to the problems identified for a specific patient or groups of patients (Swan et al., 2004).

It addresses the management and processing of data, information, and knowledge to support nursing practice and the delivery of care (Bakken, Cimino, & Hripcsak, 2004; Delaney, 2001).

2.1. Healthcare Information Technologies Used in Nursing Practice

Healthcare IT can contribute to meeting a variety of challenges in nursing practice including addressing the nurse shortage, reducing medical errors, improving monitoring and tracking of patient health information, improving efficiency and accuracy of data collection, enhancing efficiency of administrative tasks, and increasing access to care. In addition, healthcare IT can be part of establishing national surveillance capabilities to enable a more effective response in the event of a public health emergency such as a pandemic infectious disease outbreak. Key clinical challenges and technologies that can help to meet those challenges are summarized in the chart below.

Figure 6 - Key Clinical Nursing Challenges and Associated Technologies



These technologies are described briefly below.

Patient monitoring, or gathering current medical data by monitoring a patient's vital signs, is vital to healthcare. Patient monitoring devices produce the information needed by caregivers in order to deliver effective, immediate patient care; this data could also be stored in the patient's medical record to provide a more complete medical history which may be useful in future diagnoses (Bujnoch, 2007). Patient monitors are tools used in a variety of care delivery environments and include a range of devices from compact, wireless transport monitors to powerful, modular monitors for high-acuity critical care, perioperative care, and obstetrical care.

Bar Code Medication Administration (BCMA) is a point-of-care software solution that addresses the serious issue of inpatient medication errors by electronically validating and documenting medications for patients at the point of delivery or administration. It ensures that the right patient receives the right medication in the right dose, at the right time, and via the right route. The software visually alerts staff when the proper parameters are not met (United States Department of Veterans Affairs, 2006).

CPOE with CDSS is a process of electronic entry of patient treatment instructions via personal computer, laptop computer, personal digital assistant, or tablet computer. These orders are communicated to the appropriate providers or to the departments (e.g., pharmacy, laboratory, radiology) responsible for fulfilling the orders. CPOE provides improved timeliness and reduced errors, fostered

by elimination of illegible handwritten orders and redundant handling of orders before they reach their destination (Briggs, 2003a). When combined with CDSS, the system can automatically check drug-drug interaction databases and patient information such as allergies, weight, and current medications. This system can then warn providers about possible errors and/or provide useful guidelines to prescribing, including reminders about needed laboratory tests when certain drugs are prescribed (Penn Medicine, 2006).

CDSSs are designed to be a direct aid to clinical decision-making in which the characteristics of an individual patient are matched to a computerized clinical knowledge base, and patient-specific assessments or recommendations are then presented to the clinician and/or the patient for a decision (Sim et al., 2001). Benefits of such systems could include preventing adverse events due to human error (Devereux, 2001) and improving care by reducing the variability between how care is practiced by different providers (Scally & Donaldson, 1998). The use of CDSSs to facilitate the practice of evidence-based medicine has the promise to improve healthcare quality substantially (Sim et al., 2001).

Data capture can be performed with tools as low-tech and old fashioned as a stethoscope. Newer tools such as Electronic Data Capture (EDC) offer opportunities for improvement of care delivery. For example, development of unobtrusive EDC tools that capture a single-source encounter between a provider and patient will contribute to longitudinal patient records, knowledge services, and clinical repositories (Spivack, 2001).

Over the past 2 decades, electronic data capture tools have been deployed in an attempt to automate the clinical trial process and decrease the use of multi-part paper case report forms. However, the adoption of such tools has not been as rapid as originally anticipated by many. In fact, EDC is used in only approximately 30 percent of clinical studies, and the majority of those still have a paper back-up component (Kush, Bain, de Montjoie, Iberson-Hurst, & Facile, 2007).

Care Planning Tools are used by nurses to help identify potential care issues. These tools help to standardize processes of care which ease transitions for patients moving across care sectors or care delivery sites.

Telehealth is the use of electronic information and telecommunications technologies to support long-distance clinical healthcare, patient and professional health-related education, public health, and health administration. Technologies used to exchange medical information in telehealth include videoconferencing, the Internet, store-and-forward imaging, streaming media, and terrestrial and wireless communications. While new applications are being found for using these technologies, issues such as scarcity of funding, staff, and resources are significant barriers to making these technologies an integral part of daily healthcare practice (Health Resources and Services Administration, n.d.-b).

Case Study – Alamance Region Medical Center

After Alamance Regional Medical Center installed a CPOE throughout the 238-bed hospital, physicians and other clinicians responsible for medication order entry were timed with a stopwatch to compare paper-based and electronic methods. "It took 3 minutes for computer-entered orders to reach the pharmacy or other points where meds are dispensed," said Kenneth Fath, M.D., a cardiologist affiliated with the Burlington, N.C. based, community hospital. "It took an average of 96 minutes using paper (p. 45)." While this was a positive outcome, the best CPOE return for Alamance was a 72% reduction in medication errors during a 3 month period (Briggs, 2003a).

2.2. Improving the Safety and Quality of Patient Care

In evidence-based practice, nurses make clinical decisions using the best available research evidence, their clinical expertise, and patient preferences, in the context of available resources (Swan et al., 2004). As Skiba noted in 2004, "Informatics serves as an infrastructure for evidence-based practice, quality improvement, patient-centered care, and even interdisciplinary collaboration… information technologies are key to the transformation of health care delivery, and informatics is an important component of all health professionals' education (p.312)." An informatics infrastructure is an essential ingredient to evidence-based practice and patient safety. As indicated previously in this report, informatics and healthcare IT can help to address key challenges related to safety and quality of patient care including reducing medical errors, improving monitoring and tracking of patient health information, and improving access to care. In addition, there is growing interest in using healthcare IT to establish and support national health surveillance capabilities.

> "Senator Clinton said, 'Americans are blessed with access to the most advanced medical care in the world, but burdened with a healthcare system that is plagued by medical errors, wasteful duplication, and other inefficiencies that jeopardize patient safety and contribute to skyrocketing healthcare costs. Harnessing the power of health information technology will help make our healthcare system more efficient, more effective, and help make sure precious health care dollars are used wisely.'"
>
> (Lawmakers Introduce Bi-Partisan Health IT Bill, 2007, p.1)

Reducing medical errors: In 2007, the IOM released a report focusing on medication errors, which are among the most common healthcare errors. Preventable prescription medication errors are estimated to cause at least 1.5 million injuries per year in the United States in hospitals, nursing homes, and outpatient settings, with an estimated 400,000 injuries occurring annually in hospitals (Institute of Medicine, 2007). The report by the IOM places a conservative estimate of $3.5 billion on costs associated with these injuries (Institute of Medicine, 2007). In a previous report, the IOM identified IT as one of the four critical forces that could significantly improve healthcare quality and safety (Institute of Medicine, 2001). Errors involving administration of medications occur in 19 percent of doses given in hospitals and skilled nursing facilities (Barker, Flynn, Pepper, Bates, & Mikeal, 2002). The causes for medication errors include poor communication, misinterpreted handwriting, medication name confusion, lack of employee knowledge, and lack of patient understanding about a medication's directions (Meadows, 2003). Many of these errors could be eliminated if the current paper-based systems for maintenance of patient health records and provider order entry used in many facilities were replaced with electronic equivalents.

Technology such as CDSSs for providing information on medication compatibility or contraindications along with EHRs can help to reduce such errors associated with medication administration. In a study by Bates and colleagues (1998), using a CPOE system for medication ordering and fulfillment reduced serious medication errors by 55 percent. RAND Corporation researchers (2005) estimate that if all hospitals had a healthcare IT system including CPOE, around 200,000 adverse drug events could be eliminated each year, at an annual savings of about $1 billion. CDSSs combined with automatically generated reminders and alerts also contribute to the delivery of safer, higher quality patient care. This

type of decision support provides reminders or recommendations based on patient-specific data. Also, using healthcare IT to support clinical guidelines promotes collaboration with other caregivers who have access to that patient's information. It helps improve the quality of care and evidence-based standardized care processes can be utilized.

Medication administration is the last step in the medication use process, after prescription and fulfillment. The nurse dispensing a medication provides the final line of defense for the patient. The Adverse Drug Events Prevention Study Group reports that almost 40 percent of medication errors occur when the medication is administered (Leape et al., 1995). A number of technologies in use have been shown to reduce drug administration errors. These technologies include bar code technology and smart infusion pumps. Using bar code technology during medication administration helps nurses ensure patient safety by automatically verifying various aspects of the drug's dispensation.

Research has confirmed the benefits of bar code technology in regard to patient safety. Payne (2003) noted that medication administration errors decreased by 87 percent with the use of bar codes in a direct-observation study conducted at the University of Wisconsin Hospital and Clinics which monitored medication errors before and after the implementation of a bar-code medication administration (BCMA) solution. The same study also found that nurse satisfaction was increased by 42 percent when bar codes were utilized. Veterans Affairs hospitals have seen improvements in patient safety from using BCMA with their pharmacy systems. A study of 67 cases at 163 centers showed that by using the BCMA system, an estimated 380,000 medication errors were prevented over 5 years.

> A study from the Adverse Drug Events Prevention Study Group concluded that adverse drug events were common and often preventable; serious ADEs were more likely to be preventable. Most ADEs resulted from errors at the ordering stage, but many also occurred at the administration stage. The Study Group recommended that prevention strategies should target both stages of the drug delivery process.
>
> (Bates et al., 1995)

Improving monitoring and tracking of patient health information: EHR systems with patient monitoring capabilities can improve patient outcomes. Briggs (2003b) found that building adverse drug event detection and reporting capability into the EHR enabled earlier intervention. The 2003 IOM report, "Patient Safety: Achieving a New Standard of Care," emphasized the importance of an EHR with regard to patient safety (Institute of Medicine, 2003). The EHR improves the quality and timeliness of decision-making by providing nurses and other health providers with comprehensive and up-to-date information on patient status, including adverse events. To make the best treatment decisions, nurses and other caregivers must have access to the most updated patient information, as well as other supporting clinical data, at the point of care. President George W. Bush called for all Americans to have access to computer-based health records to improve their care by 2014 (American Health Information Management Association & American Medical Informatics Association, 2005). According to the ONC, the vision for a framework for a national health information network includes EHRs in widespread use (American Health Information Management Association & American Medical Informatics Association, 2005).

Improving access to care: Obtaining access to a provider can be more difficult for those who live in rural areas or otherwise have difficulty traveling to a provider. Technologies such as telemedicine or telehealth can make it easier for those individuals to gain access to care. Several studies have reported benefits associated with technologies for telemedicine which permit providers to consult with, evaluate,

and monitor patients, all while working remotely. Individual facilities have also reported that telemedicine has improved patient quality of life as agencies have used technology tools to connect with patients more frequently. This may lead to a decline in hospitalizations: in 2005–2007, South Shore Home Services in New York saw a 5 percent decrease in the agency's 9.7 percent hospitalization rate in its telehealth patients; Brookhaven Hospital Medical Center's has seen a 10 percent decrease in hospitalization rates since implementing a telehealth program (Snyder, 2007). However, there are questions to be considered. For example, where is the location of care when the patient and provider are in different geographical locations, and which jurisdiction's laws apply? It is important that clear standards be developed for issues such as these (Thede, 2001).

Establishing national health surveillance capabilities: Individual providers and payers are beginning to put in place their own EHRs. If content and technical standards are met, however, there can be additional benefits to multiple, interconnected systems, including data sharing, integration, and analysis to support functions like early detection of disease outbreaks, improved tracking of chronic disease management, and evaluation of healthcare delivery and disparities across populations. Interoperable healthcare IT that uses standards to support data interchange formats, common medical terminologies, and knowledge can facilitate the development of these capabilities.

2.3. Improving Nurse Productivity and Safety

In addition to advancing patient safety and quality of care, technology can help to improve nurse productivity and safety. IT can address the nursing shortage and key challenges related to nurse productivity including improving efficiency and accuracy of data collection and increasing efficiency of administrative tasks.

Addressing the nursing shortage: The shortage of nurses in the United States is projected to grow to 800,000 vacancies by 2020 (Health Resources and Services Administration, Bureau of Health Professions, 2002). Technology can help to address this shortage in two ways. First, technology offers the potential to improve the work environment, which can boost retention of current nurses. Second, technology offers the potential to enhance productivity of nurses in the workforce by removing barriers to practice that increase indirect care time (Gugerty et al., 2007).

Nurses work as part of a multidisciplinary healthcare team. The members of this team must effectively and efficiently communicate patient information to each other. Clinical IT enables workflow changes that can streamline care processes and facilitate communication. This improved workflow brings about the potential for more effective patient care. Such a system also helps nurses organize their priorities by generating care plans for patients. Nurses can check the system frequently for any updates or additions, to make certain all patient tasks are covered.

Many nurses feel strongly about the availability of IT solutions in the workplace as an important consideration when selecting an employer. In a CDW Healthcare study (2006), 64 percent of responding nurses said that the prerequisite of IT in the workplace was an important consideration; 26 percent said they would not consider working in a setting without IT. These findings indicate a potential recruiting advantage for IT-savvy organizations in the competitive nursing market.

Improving efficiency and accuracy of data collection: In delivering patient care, nurses must manage a great deal of information. Nurses are constantly assessing, diagnosing, planning, intervening, evaluating, and communicating information to other healthcare providers, patients, and patients' families

(Belanger, 2006). Nurses spend a large portion of their workday documenting clinical data and the care they have delivered to patients. Patient assessments, for example, are a key aspect of patient care. These assessments, which include much data collection, are a significant part of many nurses' jobs: in one study, 54 percent of Maryland nurse respondents indicated they spent 15–25 percent of their shift or visit working to complete patient documentation (Gugerty et al., 2007).

The perception by many nurses is that much of this documentation is redundant. In a Maryland Nursing Workforce Commission study conducted in 2005, 81 percent of respondents believed requirements for patient care documentation reduced the time spent providing direct patient care; 63 percent felt this happened often or very often (Gugerty et al., 2007). Technology such as CDSSs can help reduce the documentation of redundant and/or unnecessary information. It can also reduce transcription effort and associated inaccuracies. With these systems, data from previous encounters or other sources is retained from the last entry so the data doesn't need to be re-entered. EDC allows for prompt and accurate measurements, and removes transcription effort and associated inaccuracies. Point-of-care clinical documentation solutions enable nurses to focus more on the important patient care tasks at hand and focus less on documentation. Access to electronic documentation at the bedside also streamlines the care process and assists all clinicians in making better patient care decisions. Patient monitoring devices produce the information needed by caregivers in order to deliver effective, immediate patient care; this data could also be stored in the patient's medical record for more long term diagnoses. Research shows that tools for structured data collection and documentation can bring about more complete and consistent documentation of patient data (Margolis et al., 1992; Carroll et al., 2001).

The speed with which scientific nursing knowledge can be generated and utilized can be greatly accelerated by linking computerized evidence to clinical information systems, and in turn capturing and storing the documented nursing data for new quality improvement and research studies. Informatics is the vehicle to facilitate this linkage (Swan, Lang & McGinley, 2004).

Electronic documentation also improves access to critical patient information across departments. When patients are transferred from one section of a facility to another (e.g., from the emergency room to the critical care unit), it is important to ensure a seamless handoff with continuity of care. When a patient moves, the nursing staff must be able to retrieve up-to-date information in order to provide the appropriate care. Having enterprise-wide access to automated patient records ensures that access to this information is always available (McKesson Corporation, 2004).

Improving efficiency of administrative tasks: As a result of complexities of the current healthcare

Case Study - "First Health of Pinehurst, North Carolina

First Health of Pinehurst, North Carolina…needed a solution to the increas[ing] case loads burdening its nurse case managers. The nurses did not have time or the manpower to search through reams of paper to look for clinical information or track down [patient] updates over the telephone. First Health… [implemented] a Web-based solution for care coordination deployed via an application service provider model. Using the Web-based solution, First Health nurse case managers are now able to handle 10 times the number of patients than they did with their old-paper based system. Additionally, the organization has experienced improved communication, improved workflow, and improved utilization management (Kibbe & Frock, 2001).

(Russo, 2001)

environment with multiple care providers and payers, today's nurse faces an increasing amount of paperwork, which impacts the amount of time available to spend administering direct care. However, the right information technologies can improve the nursing process. Electronic charting (Day, Hoang, Ouk, Nagda, & Schriger, 1995) and CPOE can help improve efficiency and effectiveness and enhance patient outcomes (Johnston, Pan, Middleton, Walker, & Bates, 2003).

Payers and consumers are putting financial pressures on institutions. Managed care pressure for cost management and consumer demands for quality are driving forces in healthcare delivery. Faced with limits on what providers can charge and capitated reimbursement plans that provide coverage for a particular diagnosis at a set rate, institutions must increase efficiency in order to maintain profitability (Hebda, Czar, & Mascara, 2001). RAND researchers found that if properly implemented and widely adopted, healthcare IT would save money and significantly improve healthcare quality. They estimated that annual savings from efficiency alone could be $77 billion or more (RAND Corporation, 2005).

2.4. Challenges in Integrating Technology in Nursing Practice

Despite the potential benefits of healthcare IT, investment and adoption has been limited, particularly among smaller providers who are most affected by the financial costs of implementation. Only about 20–25 percent of hospitals and 15–20 percent of physicians' offices have a healthcare IT system (RAND Corporation, 2005). An American Hospital Association 2006 survey of 1500 community hospitals yielded higher numbers when including facilities with early-stage healthcare IT systems: that study found that 68 percent of responding facilities had either fully or partially implemented EHRs in 2006. The 11 percent with fully implemented EHRs were more likely to be large, urban, and/or teaching hospitals. Of the 68 percent of facilities with EHRs in place, more than half of those hospitals categorized the extent of their facility's healthcare IT use as "getting started" or "low use" in 2006 (American Hospital Association, 2007). Small hospitals and hospitals with half or more of their patients on Medicare are less likely to have healthcare IT. Generally, those who pay for healthcare IT do not receive the related savings, which is therefore a market disincentive. For example, hospitals that use healthcare IT to reduce adverse drug events also reduce bed-days — and reduced bed-days mean reduced hospital income (RAND Corporation, 2005).

Among the challenges of establishing effective healthcare IT in clinical settings are the cost of purchasing and installing a system, the cost and availability of healthcare IT expertise, the importance of understanding the changing marketplace for healthcare IT vendors, and the difficulty of implementing the system while still providing care to patients (Hansen-Turton, 2007). RAND Corporation researchers (2005) estimated that widespread implementation of healthcare IT would cost around $8 billion per year, assuming adoption by 90 percent of hospitals and doctors' offices over 15 years.

Without proper training of nurses, efforts to integrate healthcare IT with nursing practice will be hampered. There is evidence that nurses are not getting adequate training to participate in IT integration or usage. A survey of 559 nurses released by CDW Healthcare in September 2006 found nearly 30 percent of respondents indicated they had not received IT training in the last year, while 56 percent had received only 1 to 8 hours of training. Some 55 percent of respondents said more IT training would have the greatest impact on improving their use of IT. Despite training issues, 86 percent of nurses in the study remained optimistic regarding the potential for IT to improve patient care (CDW Healthcare, 2006).

A study by Pravikoff, Tanner, and Pierce (2005) examined registered nurses in the United States to assess nurses' access to information resources and their perceived skills in using these resources. Among the key findings were that almost half were not familiar with the term "evidence-based practice," although it has appeared in the titles of thousands of articles published in nursing journals. Furthermore, most nurses surveyed did not search in appropriate information resources such as Medline or the CINAHL database to gather practice information. Those who did search the appropriate information resources did not feel confident at doing so (Pravikoff et al., 2005).

These findings and others point to the need to reemphasize commitment to information literacy and healthcare IT competencies in general. This is especially important as the healthcare delivery system becomes more informatics rich and schools of nursing incorporate more technology tools into their curriculum (Skiba, 2005). Increased numbers of nursing informatics specialists in practice and increased emphasis on healthcare IT in schools on nursing would help increase informatics competencies among practicing nurses.

Accelerating adoption among all kinds of hospitals will require a shared commitment between providers, payers, and purchasers. Hospitals currently bear almost all the costs of IT investment but are not reimbursed by insurers or patients at higher rates for the use of these new technologies. However, many of the financial benefits of IT — such as decreased need for repeat tests, lower readmission rates, and shorter stays — accrue to those who pay for care. When considering how to finance healthcare IT adoption, policymakers should give special attention to hospitals with less stable finances, smaller hospitals, and rural hospitals which may need additional financial support as compared to their peers. Other barriers to IT use, such as lack of systems that share data easily, challenges in managing work process changes, and lack of trained IT staff also must be addressed by policymakers and hospital administrators (American Hospital Association, 2007).

> "'It is not at all unusual for a system to be imposed on nurses,' said Melissa Foster, manager of nursing informatics at Homestead Hospital in Homestead, Fla. 'People assume that nurses — especially older nurses — don't care for computers. I don't think that is necessarily true. I think it's more that chief information officers have bought systems without consulting nurses, who are then left with a system that doesn't fit with their work processes.'"
>
> (McAdams, 2006, para. 15)

2.5. Summary

Recent advances in software technology allow for monitoring of vital signs with more in-depth, accurate information. This leads to patient monitoring devices creating larger and more detailed pieces of information to help health care workers in their diagnoses, but also increases the need for information management solutions. Health care providers' level of health care can easily be limited by the capacity of their information management system. If technology continues to advance in its current direction, health care delivery sites will need to adopt up-to-date digital information management systems as cutting-edge patient monitoring technologies become more dependent on large scale information handling capabilities (Bujnoch, 2007).

Too often healthcare IT systems are designed by informatics experts and purchased from vendors with little or no input from nurses (Simpson, 2003, as cited in Swan, Lang, & McGinley, 2004). These

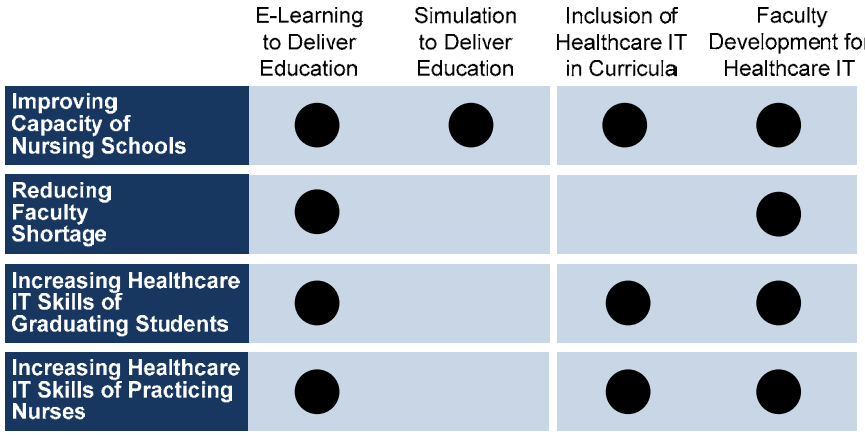
decisions and choices could benefit from nurses' critical thinking and problem-solving skills. Nurses are the largest group of users of healthcare IT systems in most healthcare settings. Greater nurse input to the design, customization, and implementation of the systems may increase nurses' use of the technology, as well as produce systems that improve quality of care because they are more responsive to nurses' needs. To increase nursing representation in IT planning, the number of nurse informaticists in the workforce must be increased. The NACNEP recommends that the Federal government should facilitate nursing involvement in the planning, design, implementation, and evaluation process by increasing funding for the education of nurse informaticists, and should require nurse participation on Federal healthcare IT committees.

While existing research indicates the use of healthcare IT can reduce medical errors, improve efficiency, and improve quality and timeliness in other areas, there remains a need for additional research focused on the adoption of IT among the nursing workforce and more information on the costs of IT. The Federal government should provide more support for research and demonstration projects to assess the impact of technology on student learning, capacity to train additional students, and patient outcomes. Technology is being implemented at the local level by a number of organizations. To ensure that such efforts are being implemented using best practices, and in a way that optimizes interoperability, the NACNEP recommends that policy-makers provide funding to identify and create linkages and to disseminate best practices.

3. Integration of Healthcare IT and Use of Technology in Nursing Education

As healthcare IT is increasingly adopted into nursing practice, it is vital that nurses are prepared in basic, graduate, and continuing education with the skills to use that technology to improve the work environment and improve patient outcomes. In addition, technology offers solutions for a variety of challenges in nursing education including improving capacity at nursing schools and reducing the faculty shortage. Key education challenges and related technology solutions are outlined in the chart below.

Figure 7 – IT Solutions for Nursing Education Challenges



Improve capacity of nursing schools: One of the key factors contributing to the nursing shortage is the limited teaching capacity in nursing schools. Using technology such as e-learning can improve institutions' abilities to leverage those resources and expand teaching capacity.

Reduce faculty shortage: The faculty shortage is a key factor in nursing school capacity constraints. Initiatives for faculty development and e-learning can reduce the impact of this shortage.

Increase healthcare IT skills of graduating students: Core informatics knowledge and healthcare IT competencies are essential for all nurses to function effectively in the current healthcare environment. Inclusion of healthcare IT topics in curricula, along with more faculty trained in healthcare IT and informatics, can address this challenge.

Increase healthcare IT skills of practicing nurses: Continuing education is needed to educate practicing nurses in healthcare IT and informatics competencies.

3.1. Integration of Healthcare IT in Nursing Education

The Educational Testing Service (2007) defines information and communication technology literacy as the ability to use digital technology, communication tools, and/or networks appropriately to solve

information problems in order to function in an information-rich environment. This includes the ability to use technology as a tool to research, access, manage, integrate, evaluate, and communicate information, and the possession of a fundamental understanding of the ethical/legal issues surrounding the access and use of information. Information and communication technology literacy is the ability to think critically in a digital environment. The focus is not on the knowledge of technology but, rather, on the ability to use critical thinking skills within a technological framework.

To facilitate this training, minimal skill sets should be identified in the areas of computer literacy, information literacy, and informatics. Associated changes to address these skill sets should be made to curricula, both in nursing schools and in continuing education programs. Critical to this effort is identification of standard basic-level and specialty-level nursing competencies for healthcare IT, and the role of nursing faculty in teaching healthcare IT and their support needs to incorporate these competencies into the curriculum (Keefe, 2007).

Core informatics knowledge and healthcare IT skills are essential for all nurses to function effectively in the current healthcare environment (Carty & Phillip, 2001, as cited in Swan, Lang, & McGinley, 2004). Several organizations have created or are developing guidelines on healthcare IT and informatics competencies. The ANA in the Scope and Standards of Nursing Informatics maintain that all nurses need computer and information literacy (American Nurses Association, 2008). The ANA has begun this process of identifying informatics competencies for nursing education for both nursing generalists and informatics specialists (American Nurses Association, 2008).

> "Nursing informatics (NI) integrates nursing science, computer and information science, and cognitive science to manage, communicate, and expand the data, information, knowledge, and wisdom of nursing practice. Nurses trained in NI support improved patient outcomes through their expertise in information processes, structures, and technologies, thus helping nurses and other care providers to create and record the evidence of their practice."
>
> (American Nurses Association, 2008)

The Quality and Safety Education for Nurses (QSEN) project faculty have defined quality and safety competencies for nursing and proposed targets for the knowledge, skills, and attitudes to be developed in nursing pre-licensure programs for these competencies: patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics (Quality and Safety Education for Nurses, 2007).

Fetter (2008) surveyed faculty members with undergraduate teaching responsibilities at a college of nursing, seeking their perspectives and priorities. The faculty members reported that most students embrace informatics and technology, with most freshmen arriving at school with basic competencies in word processing, Web search, and e-mail functions. However, Fetter (2008) found the respondents cited information literacy as a critical and needed curriculum thread. Students struggled with learning how to critique information sources and many had difficulty constructing coherent literature reviews from Internet and other information sources. The faculty recommended mapping leveled information literacy objectives into specific courses and more emphasis on writing and publication ethics.

The Technology Informatics Guiding Educational Reform (TIGER) Initiative is a collaboration among the Alliance for Nursing Informatics (ANI), with its 20 nursing informatics professional societies, and the major nursing organizations including the ANA, the Association of Nurse Executives (AONE), the American Association of Colleges of Nursing (AACN), and others which collectively represent over

2,000,000 nurses. TIGER's goal is to create and disseminate action plans that can be duplicated within nursing and other multidisciplinary healthcare training and workplace settings. The objectives of the TIGER Informatics Competencies Collaborative (TICC) are to create informatics competencies for all levels of nursing education; create informatics competencies for nursing practice; advocate for and support adding informatics competencies into nursing specialty certifications; and include informatics competencies in the scope and standard statements (and like documents) of nursing specialties (Technology Informatics Guiding Educational Reform Informatics Competency, n.d.).

There are few evaluations of nursing students' basic computer competencies reported in the literature. The Gassert/McDowell Computer Literacy Survey was implemented to evaluate the self-reported nursing informatics competence of undergraduate baccalaureate students upon admission and graduation in the years from 1997 to 2005 and to compare the differences between admission and graduation. This survey was given to 411 students on admission and 429 students on graduation from a baccalaureate nursing program. Results showed a significant increase during the 8 year period, both on admission and graduation, for reported level of experience with non-analytical applications such as word processing, electronic mail, and the Web. However, experience in analytical applications such as spreadsheets, databases, and use of statistical programs did not increase significantly (McDowell & Ma, 2007). The results of this study indicate nursing education programs currently may not be providing new nurses with the analytical tools needed to work effectively and efficiently in the increasingly technology-rich healthcare arena.

In March 2006, the National League for Nursing's (NLN) Informatics Competencies Task Group of the Educational Technology and Information Management Advisory Council surveyed faculty and nursing education administrators. Five hundred forty deans/directors and 1,557 faculty responded. According to the survey, approximately 60 percent of programs had a computer literacy requirement and 40 percent had an information literacy requirement. Only 50–60 percent of respondents said that informatics was integrated into their curriculum and that experience with information systems was provided during clinical training. The survey also revealed that while many schools of nursing provide some focus on computer and information literacy, there was considerable confusion as to what nursing informatics entails and what constitutes the necessary knowledge to practice in an informatics-rich environment (National League for Nursing, 2008).

The results of this survey led to action at the May 2008 meeting of the NLN Board of Governors, at which they issued a position statement, "Preparing the Next Generation of Nurses to Practice in a Technology-rich Environment: An Informatics Agenda." This position statement calls on faculty, deans, administrators, and the NLN itself to advocate that all students graduate with up-to-date knowledge and skills in each of three critical areas: computer literacy, information literacy, and informatics. The NLN's CEO Dr. Beverly Malone spoke at the meeting in support of this effort: "[The NLN's] position statement's intent is to support the reform of nursing education to promote quality education that prepares a technology-savvy workforce capable of practicing in a health care environment where technology continues to increase in volume and sophistication… The informatics revolution will impact all of nursing practice, so nurse educators across the academic spectrum must be equipped" (National League for Nursing, 2008, para. 5).

3.2. The Need for More Nurse Informatics Specialists

As the transition to healthcare IT and nationwide usage of EHRs gains momentum, healthcare will require a work force capable of innovating, implementing, and using health communications and IT. Health information specialists or nursing informatics specialists concentrate on health information management, applied clinical informatics, and IT resource management. While the need for this specialist work force is growing, the number of trained professionals is not keeping pace. Furthermore, no systematic plan exists for training the members of the current healthcare workforce to use IT tools to do their jobs. Without a plan to train clinicians and existing health information specialists at all levels of healthcare delivery, the goal of an improved, interconnected healthcare system may never be met, and the industry may lose much ground in terms of quality safety, and efficiency as it moves toward an electronic future (American Health Information Management Association & American Medical Informatics Association, 2005).

The Nationwide Health Information Network Workforce Study: Final Report released in 2007 produced quantitative estimates of the workforce's labor needs: assuming a 5-year time frame for the NHIN implementation, the results indicated that 7,600 specialists are needed for installation of EHRs for the approximately 400,000 practicing physicians who do not have them already. For the hospitals needing EHRs (about 4,000), approximately 28,600 specialists are required. Finally, about 420 individuals are needed to build the health information infrastructure systems in communities to interconnect all these other systems (Altarum Institute & NHII Advisors, 2007). A healthcare workforce that is trained and competent in healthcare IT is critical to the widespread adoption of healthcare IT, particularly during implementation (Electronic Health Records Workgroup, 2008).

The identification of health informatics competencies and the development of curricula to support education and training are essential for the widespread adoption and effective use of healthcare IT to improve patient outcomes (Electronic Health Records Workgroup, 2008). Additional informatics faculty are needed to teach in specialty programs and to prepare other faculty to teach basic informatics skills to entry level nurses. In addition, there is a need to expand the HRSA program to fund additional collaborative initiatives among nursing schools that will teach nursing faculty how to use telehealth, simulation, and informatics so they in turn will be able to include these skills throughout nursing curricula (Technology Informatics Guiding Educational Reform & the Alliance for Nursing Informatics, 2007).

3.3. The Role of Technology in Enhancing Nursing Education

One of the key factors contributing to the nursing shortage is the limited teaching capacity in nursing schools. A 2004 survey by the AACN found that 32,797 qualified applicants were not accepted into schools of nursing in 2004, largely due to faculty shortages and resource constraints (Berlin, Wilsey, & Bednash, 2005). The most common reasons for not accepting qualified applicants were insufficient faculty (76 percent), filled admissions seats (75 percent), and insufficient clinical teaching space (55 percent). While there are upfront costs associated with implementation, using technology such as e-learning and simulation can improve institutions' abilities to leverage limited resources and thereby expand teaching capacity.

> "It's so important for nursing students to practice what they learn in the classroom before they deal with actual patients," explained NLN CEO Dr. Beverly Malone. "Students and faculty get very tied up in making the simulation real for themselves. It helps eliminate some of their insecurity, because they know they're inexperienced, and they don't want to hurt anybody."
>
> (National League for Nursing, 2007, para. 2)

E-learning technologies allow a teaching institution to reach more students over a larger geographic area. Simulation and virtual technologies offer adjuncts to live clinical education, reducing barriers associated with limited experiences, limited clinical sites, and limited clinical faculty resources (Krautscheid, & Burton, 2003). This approach can be very effective for reaching place-bound and time-bound students by allowing them to participate in classes without requiring them to be in a specific location at a specific time. This is especially effective for rural students and working students. This technology can help effectively leverage limited teaching resources like classroom space.

The HRSA-funded Comprehensive Geriatric Education Program (CGEP) and the Central Plains Geriatric Education Center (CPGEC) are both carried out by out by the University of Kansas Medical Center. In the state of Kansas, these two programs rely heavily on distance learning to connect geographically-separated healthcare providers and students (Redford, 2007).

There are large, upfront development costs and a significant learning curve for faculty associated with integrating e-learning technologies. In addition, successful integration of these technologies requires careful planning, implementation effort, and good communication with the school's IT staff (or the need to implement an IT staff) and an open-minded faculty who are willing to explore new ways of teaching to integrate the technology.

Clinical simulation is another IT tool that is growing in acceptance and adoption. The goal of simulation technology is to provide a representation of a clinical event or situation in order to teach theory, develop clinical reasoning skills, assess progress, and integrate technology. Simulations can be used in a variety of educational contexts such as teaching, assessment, or as a practice activity. High-tech simulators mimic reality by presenting a "patient" with medical complaints and displays of vital signs, such as heartbeats and blood pressure, for students to monitor by using standard hospital equipment. Simulations spare actual patients from risk and also offer additional advantages: clinical situations can be manipulated, learning times can be designated, multiple learners may use the same simulation, active learning is promoted, clinical sites and faculty can be better leveraged, and immediate feedback may be delivered and received (National League for Nursing, 2007a).

For these reasons, the use of simulations is growing in nursing education. However, there are various challenges related to the use of simulations. Simulation is expensive, it requires physical space to execute, and there are a limited number of faculty members who can facilitate simulations. In addition, curricula must be rethought and restructured to reflect the shift from a teacher-centered process to a student-centered process. Organizations that approve nursing curricula also must determine the amount of simulation that can substitute for actual human patient interaction for accreditation of education institutions. Options for enabling greater use of simulations might include increasing the number of students participating in a simulation learning activity or increasing the number of roles involved (e.g., observer, family member, nurse). Another approach is to videotape a simulation learning activity and then use the video as a teaching tool.

> "The use of simulation technologies will help engage learners in a process that provides the interaction they desire with the feedback they need in real-time situations. Through the design of pertinent scenarios, faculty can direct learning in a way that facilitates student understanding of subtle changes that occur in patient care. This may help prepare Net Generation students for the transition to the work force as new nurses by nature 'tend not to focus on individual client needs' and 'may be unaware of relevant cues in changing client situations' (Ferguson & Day, 2004, p. 490)."
>
> (Skiba & Barton, 2006, para. 27)

There has been limited research on the effectiveness of simulations as a teaching tool. Some small outcome studies show positive results but there are limitations to these findings given the size of the studies. There is a need for organized, systematic research in this area (Jeffries, 2007). The National League of Nursing/Laedral Study conducted an eight-site study to help address this research gap. That study found that students who used a high-fidelity patient simulator reported a greater sense of being involved in diverse ways of learning, more opportunities to problem-solve and make decisions in the simulation, and perceived a greater presence of active learning, as compared to their counterparts who were engaged in lower-fidelity simulations. Students who worked with the high-fidelity patient simulator and a static mannequin simulation reported significantly greater confidence about their ability to care for a postoperative adult patient than did students in the paper/pencil case study simulation group who did not use any interactive technology tools. Overall, students in the high-fidelity patient simulator group were significantly more satisfied with their learning activity than their peers who were in lower-fidelity work groups. While more research is needed, this study appears to show that immersion in simulation provides the opportunity to apply and synthesize knowledge in a realistic but non-threatening environment. Active involvement and the opportunity to apply observational, assessment, and problem-solving skills, followed by a reflective thinking experience, leads to increased self-confidence in students (National League for Nursing & Laerdal Medical, 2006).

To further integrate the use of simulations, policy-makers should promote the development of consortia where educators, clinical agency partners, and the workforce work together to develop and program case scenarios for the simulations used in nursing education; provide faculty development in the area of simulations; conduct multi-site simulation research to contribute to the science of nursing education; and develop partnerships to purchase, share, and use equipment (Jeffries, 2007).

3.4. The Role of Nursing Faculty

Incorporating technologies as tools for teaching and teaching technology competencies to nursing students will require significant faculty development and transition time. Faculty need to be comfortable teaching with and using this technology. Currently, there is an inadequate number of nursing education faculty members qualified to teach informatics. McNeil et al. (2003) found that "Faculty who were rated at the 'novice' or 'advanced beginner' level for teaching information technology content and using information technology tools are teaching information literacy skills" (p. 341). Furthermore, participants in that same study reported no future plans to offer nursing healthcare informatics training in their region.

Faculty expertise in the creation, selection, and use of the technology is a major factor influencing student success and satisfaction. McNeil et al., (2003) found that schools of nursing deans/directors perceive a growing need for nurse educators who are prepared to lead change related to informatics. In a survey of nursing education programs, 75 percent of the respondents reported having an informatics champion who was interested in promoting the integration of informatics concepts and skill into the nursing program curricula.

The ITNEP initiative grew out of recommendations from a panel of experts, the Nursing Faculty Development in Simulated Learning Work Group, which first met in March 2005. The purpose of ITNEP is to support participating nursing collaborations for faculty development in the use of various technologies. The participants will use technology to enhance nursing education and practice, optimize patient safety, and bring about improvements in healthcare quality.

> "For years, the lecture method was considered the gold standard for teaching, but faculty are now faced with demands from administrators, colleagues, and students to use other, technology-driven teaching techniques… Students no longer look to traditional sources of knowledge for their learning. Rather, they look to the Internet, usually Google or Wikipedia, and we as faculty must remind them that libraries contain knowledge that may be valuable to their learning… Faculty use technology as a means of disseminating knowledge, such as using PowerPoint or placing documents on a webpage for students to review. Students see technology as a tool for active learning."
>
> (Skiba, 2007, p. 342)

ITNEP participants will be required to offer state-of-the-art training sites; promote awareness of the use of simulations, informatics and telehealth; and develop innovative faculty development approaches related to these technologies. Applicants must be collegiate schools of nursing; must demonstrate expertise in simulated learning, informatics, and telehealth; and must have sufficient institutional resources to support the project. Program requirements include forming a collaborative partnership, convening an internal executive committee, planning for developing a state-of-the-art training site, and planning for teaching academic and clinical faculty on use of information and other technologies. The initiative cautions that for the collaborative partnership, a public/private partnership is often a good model, but institutions should be careful to avoid conflicts of interest and to ensure agreement on intellectual property understanding and rules. In addition, funded programs must train 30–50 faculty members per year and have an evaluation plan in place to assess the activities of trainees after the training experience has concluded (Rodrigue & Mix, 2007).

The Health Information Technologies Scholars (HITS) project is funded by the ITNEP initiative. This project is a collaboration between the National League of Nursing, the University of Kansas in Kansas

City, the University of Colorado Health Sciences Center School of Nursing in Denver, and Indiana University School of Nursing in Indianapolis. The purpose of the project is to produce a cadre of faculty scholars with the knowledge and skills in applied informatics and technology-supported education. This background prepares nurses for clinical practice by helping them develop the competencies required in an information technology-driven healthcare system (National League for Nursing, 2007b). HITS is working to transform teaching and learning through the merger of informatics, telehealth, simulation, and e-learning and the creation of powerful learning environments (Skiba, 2007).

To reach these goals, faculty will be assigned to mentors and will form e-communities to facilitate the creation of institution-specific projects. Workshops and online seminars, or webinars, will offer opportunities to network, share experiences, advance learning, and provide support for scholars. In the final phase, faculty will implement, evaluate, and disseminate their projects at their respective institutions (Skiba, 2007).

3.5. Summary

As facilities increasingly adopt healthcare IT, it is vital that nurses are equipped with the skills to use that technology. To integrate technology into nursing education curricula and teaching methods, consideration must be made for challenges and constraints of the educational and clinical practice environments. One of the key constraints is lack of availability of faculty and other resources. The NACNEP recommends that policymakers focus on initiatives that will support capacity building through the creation and development of public/private partnerships to create and sustain healthcare IT across settings and the continuum of care, including education.

There are significant up-front costs for developing and delivering curricula in technology. Additionally, many schools lack the resources needed to incorporate technology into their programs. As TIGER and the Alliance for Nursing Informatics (2007) note, there is a need to strengthen and expand federal programs that provide funding for nursing curriculum development, research, and practice in nursing informatics and IT adoption. In order to facilitate incorporation of IT into the nursing curricula, the Federal government should provide more funding for faculty development in teaching technology and teaching with technology. These funds could be used to support additional ITNEP grants or the Centers of Excellence that focus on teaching technology and helping other institutions teach technology. The Federal government should provide more funding for grants to help colleges and universities make the transition to offering distance learning and simulation training in order to allow place-bound and working nurses access to baccalaureate and graduate nursing education, and continuing education.

4. Recommendations

The National Advisory Council on Nurse Education and Practice reviewed the opportunities and challenges described above at its 116th meeting in April 2007 and developed a set of recommendations that are put forward in this report. The following recommendations are directed to the Department of Health and Human Services and the United States Congress:

1. Involve nurses in the planning and design process for healthcare IT at the local, state, and Federal levels. Nurses are the largest group of users of healthcare IT systems in most healthcare settings. Greater nurse input to the design, customization, and implementation of the systems may increase nurses' use of the technology, as well as produce systems that improve quality of care because they are more responsive to nurses' needs.

2. Support initiatives to prepare more nursing informatics specialists. Nurse informaticists can play a leadership role in representing nursing in IT planning and integration of IT and informatics into nursing practice.

3. Support the creation and development of public/private partnerships to improve adoption of healthcare IT and informatics in practice. These partnerships will help address constraints such as lack of available faculty and other resources for integration of technology into nursing curricula and teaching methods.

4. Support the use of IT and technology tools in education; support the incorporation of healthcare IT and informatics into curricula and the evaluation of educational outcomes. Technology tools in education can help to improve capacity of nursing schools. Incorporation of healthcare IT into curricula can increase the healthcare IT skills of graduating students. The development of health informatics curricula will be essential for the widespread adoption and effective use of healthcare IT to improve patient outcome.

5. Support research and demonstration projects to assess the impact of various technologies such as e-learning and simulations on student learning, capacity to educate additional students, faculty workload, and patient outcomes. There has been limited research on the effectiveness of simulation learning activities as teaching tools. While studies show positive results from implementation of technology, such as simulations in education, more research is needed to determine how best to deploy these technologies.

6. Provide more Federal funding for capacity building (e.g., faculty development) in teaching about health information technologies or informatics and teaching with technology. There is an inadequate number of nursing education faculty members qualified to teach informatics and use technology teaching tools. Improving capacity in this area would improve student success and help address the faculty shortage.

7. Facilitate dissemination of best practices for integration of healthcare IT and associated training and systems implementation in nursing practice. Technology is being implemented at the local level by a number of organizations. To help ensure that such efforts are being implemented using best practices, and in a way that optimizes interoperability, efforts should be funded to identify and create linkages and to disseminate best practices.

8. Increase Federal funding grants to help colleges and universities incorporate technologies such as e-learning and simulation training in order to allow place-bound and working nurses access to baccalaureate and graduate nursing education, and continuing education. To deliver effective

evidence-based practice supported by healthcare IT, the nurse workforce needs the proper healthcare IT competencies, including information literacy, and access to research information.

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