Chapter 1

THE CASE FOR HEALTH WORKFORCE PLANNING IN TEXAS

INTRODUCTION

The *2007-2008 Texas State Health Plan Update* (*2007-2008 Update*) is the first biennial update to the *2005-2010 Texas State Health Plan* (State Health Plan). The purpose of the *2007–2008 Update* is twofold. First of all, the document provides a status report on health workforce issues addressed as priorities in the *State Health Plan* and identifies other critical workforce issues arising since the production of that document. Second, the *2007-2008 Update* outlines how information technology may be incorporated in the education and training of health care professionals and in the health service delivery system to help ensure Texas retains a quality health care workforce today and for the future.

In an effort to provide Texas leaders with the information they need to prepare for ensuring a quality health workforce, the SHCC created a biennial process, the Statewide Health Workforce Symposium. The Symposium is used to gather accurate and objective information to enable legislators, policy makers, community leaders, and professionals in the private sector to set clear and effective health workforce policies for Texas. The Symposium provides an opportunity for experts in the health workforce field to openly discuss the issues and consider potential policy directions.

To provide a platform for the Symposium, and ultimately for development of the *State Health Plan,* a review of recent literature is conducted on the state of the health workforce. This information, as well as contributions from other health workforce experts in Texas, is incorporated into this *State Health Plan*.

Due to the passage of SB 45, 79th Regular Legislative Session, the SHCC incorporated both health workforce and health information technology and partnered with the Texas Health Institute to host the 2006 Statewide Health Workforce and Health Information Technology Summit. The event, which was attended by an estimated 200 stakeholders, was held in Austin on May 8, 2006, and highlighted two topics: "Public Health Implications for Creating a Health Information Technology Infrastructure" and "Health Professions Workforce Development to Support a Technology-Rich Environment."

I. STATUS OF PRIORITY ISSUES INCLUDED IN THE *2005–2010 TEXAS STATE HEALTH PLAN*

Although the most critical workforce issue identified in the *2005-2010 Texas State Health Plan* was the nursing shortage, many of the recommendations focused on strengthening four interdependent workforce areas:

- Telemedicine and telehealth;
- General recruitment and retention;
- Ensuring a quality workforce for the aging Texas population; and
- Ensuring a quality public health workforce.

The following paragraphs provide a brief status update on each of these four workforce areas.

Telemedicine and Telehealth

The lack and distribution of available qualified health professionals continue to be major barriers to accessing health care in rural Texas and in many urban areas. Telemedicine technologies, including teledentistry, hold promise for providing greater access to medical care, ensuring quality of care, and containing costs through early diagnosis and intervention.

Telehealth technologies provide an avenue to maximize scarce resources, such as faculty and building infrastructure, in the education of our future health workforce. Additionally, telehealth extends our capacity to provide educational programs to potential students located in geographic areas that historically have lacked access to health education and training. Other new technologies, such as patient simulation laboratories, can also provide opportunities to increase the number of educated health professionals.

The SHCC continues to view telemedicine and telehealth as a critical strategy to address the numbers and maldistribution of health professionals and to increase access to health care and health education through technology. Although numerous telemedicine and telehealth projects and networks are now functioning throughout the state, there continues to be no designated agency or body to serve as the authority and coordinator for these projects.

During the 78th Regular Legislative Session, S.B. 691 charged the Texas Health and Human Services Commission (HHSC) with implementing telemedicine in ways that are cost-effective and

clinically effective, and parallel Medicare where appropriate. HHSC administers Medicaid and the Children's Health Insurance Program, and has reached the following milestones in complying with S.B. 691:

- met with the Telemedicine Advisory Committee on January 5, 2004;
- submitted a communication and work plan to the Telemedicine Advisory Committee in May of 2004;
- submitted a telemedicine article for publication in the July–August *Texas Medicaid Bulletin*;
- organized a Mental Health and Mental Retardation Telemedicine Sub-Workgroup responsible for implementing initiatives specifically geared toward mental health and mental retardation; and
- drafted a letter to medical associations to step up provider education on the use of telemedicine technology and Medicaid billing guidelines.

General Recruitment and Retention

The importance of recruitment and retention activities to ensuring a quality health workforce cannot be overstated. An adequate supply of quality health care providers is critical to the stability of medical services throughout the state and especially in rural and underserved urban areas, where ensuring an adequate supply has always been a challenge. During the last two years, the state's fragmented programs have made attempts to coordinate their efforts. However, many of these programs that were already underfunded face additional reduction of resources available to accomplish the task. The unfortunate result of this fragmentation and the cuts is Texas has fallen behind the national averages in the supply of many health professionals. This issue is discussed and detailed at length in Chapter 2 and in Appendix B.

Ensuring an adequate supply of health professionals is the product of three interrelated processes. Recruitment of the workforce is the first step. Strategies are currently being developed and acted upon by educational and professional organizations in order to expand the number of people who enter the health workforce. Numerous public and private agencies and organizations have made strides in the last decade to develop and expand the pool of young people who are ready to enter the health workforce. Unfortunately, in the nursing workforce within the last year, the number of qualified applicants has far exceeded the educational system's ability to admit

and graduate the students. The greatest reason is the lack of qualified nursing faculty. This is expected to worsen, as the average age of nursing faculty is even higher than the average age of the nursing workforce.

The second step to ensuring an adequate supply of health professionals is to guarantee that systems are in place to support those students who have chosen to enter a health profession. In order to accomplish this, it is necessary to address the shortage of faculty and educational infrastructure to support these students, as mentioned above. It is equally important to address and attempt to fulfill the financial, personal, and cultural needs of these persons. The Texas health workforce does not currently reflect the ethnicity of the state. All health professions fall short of having the optimal numbers of minority-group members represented in their ranks. Chapter 2 and Appendix B provide racial-ethnic data on various health professions where information is available. Several health professions still do not collect and report racial/ethnic data. However, it is imperative that these data be collected in the future to allow policy leaders and educators the information necessary to plan for a culturally representative and culturally competent workforce for Texas.

The third and final step to ensuring a quality health workforce is to guarantee systems are in place to retain health professionals to practice in Texas. To be effective in this three-step process, the state must accomplish the following: strengthen the systems for collecting and coordinating health workforce supply and demand data, faculty and enrollment data, migration study data, and retention data; improve the coordination efforts in health workforce development and in recruitment and retention; improve systems to increase minority recruitment and systems to guarantee success; and support community-level recruitment and retention efforts throughout the state.

The state's three Area Health Education Center (AHEC) programs continue to serve a vital role in the recruitment and retention of health professionals within the state. The AHECs cover mutually exclusive geographic service areas through 16 fully operational regional centers. Three additional centers are in development in West Texas.

This community-based network conducts extensive programming on health careers promotion and recruitment; community-based education for health professions students; practice entry and support for community health professionals; health literacy for residents of communities; and assessment and refinement of community health delivery systems.

Funding for graduate medical education (GME) was severely cut during the 78th and 79th Regular Legislative Sessions, negatively impacting the state's ability to attract physicians. The

cuts resulted in stress to existing GME providers and negatively impacted their ability to provide residency programs to medical graduates. Several of the current residency programs are at risk of closing due to these cuts. Many of our state's medical graduates are leaving Texas for their residency training, and many of them are choosing to remain in other states to practice, resulting in a huge financial burden and a huge loss of intellectual capital for our state's medical and educational system. Research indicates the location of the training program for residents and fellows is a major determining factor for where they ultimately establish a medical practice. According to a recent Texas Medical Association Committee on Physician Distribution and Health Care Access, those who graduated from a Texas medical school and completed residency or fellowship training in the state were close to three times as likely to remain in the state as medical school graduates from other states or countries.

Workforce for the Aging Texas Population

The issues impacting our state's ability to provide an economically feasible health workforce to provide quality care to the aging Texas population are compounding. A growing population of elderly combined with an increase in the incidence of obesity and the related increases in chronic disease associated with obesity, paint a very challenging picture for Texas and the nation as well. Recent program funding cuts have further reduced our state's ability to meet the future health workforce needs of our aging population.

All involved in Texas health workforce planning must consider alternative health care delivery systems that will concentrate on the prevention of chronic disease and the efficient management of chronic disease through evidence-based health care and proven treatment guidelines. Empowering individuals to accept responsibility for their own wellness through prevention and education programs is also critical. Determining the optimal type, mix, and number of health care providers, and the competencies desirable for those providers to possess are the critical challenges Texas must meet.

Ensuring a Quality Public Health Workforce

To ensure the health of all Texans, we must have a strong public health infrastructure; and a competent public health workforce is an essential component in meeting this challenge. As a result of the urgency surrounding bioterrorism preparedness, Texas continues to receive additional resources to build and improve the public health workforce capacity. The Texas public health infrastructure as a whole is stronger and more capable of meeting all public health challenges and emergencies as a result of this influx of funding related to bioterrorism preparedness.

Also, consideration must be given to the impact terrorism will have on the health professions workforce. First of all, the threat of terrorism will dictate the numbers and types of health professionals needed and the type of education and training they should receive. The demand for physicians and registered nurses in the acute care setting will be further exacerbated in the face of a large-scale disaster that results from an act of terrorism. The health professions workforce should be a part of regional planning efforts to prepare for an act of terrorism, so that they can prepare to fulfill their identified future role in managing an event.

The public health workforce will also continue to be an important partner in the effort to prevent and manage chronic disease in the population. Education and prevention efforts, which have long been the tools of the public health workforce, provide an avenue that can produce huge savings in the delivery of health care by teaching "wellness" to individuals in the community.

Nursing Shortage in Texas

Surveys, studies and demographic trends show the nursing shortage is due to the following factors:

- Increase in the state population growth along with an increased older population of Texas residents;
- Increase in uninsured and underinsured citizens with more health care needs;
- Increase in the level of care needed for those who are critically and chronically ill;
- Decrease pipeline of new students to nursing;
- Decline in RN earnings relative to other career options;
- Increase in the aging of the nursing workforce resulting in a majority of nurses retiring and leaving the nursing workforce; and
- Increase in vacancy and turnover rates.

The Texas Center for Nursing Workforce Studies (TCNWS) conducted two statewide surveys on hospital nurse staffing in 2004 and 2006. In 2004, 163 hospitals reported an average hospital RN vacancy rate of 8.6 percent and 15.6 percent RN turnover rate. It took 36 percent of the employers 60 days to fill an RN position, and up to 38 percent of the employers reported it took more than 90 days to fill RN positions for the 7 pm to 7 am, night and evening shifts.[1] In 2006, preliminary findings indicate 235 hospitals reported an average RN vacancy rate of 10.2 percent and 226 hospitals reported an average RN turnover rate of 18.2 percent.[2] The increase in the vacancy and turnover rates reflect the gap between supply and demand for nurses continues to widen.

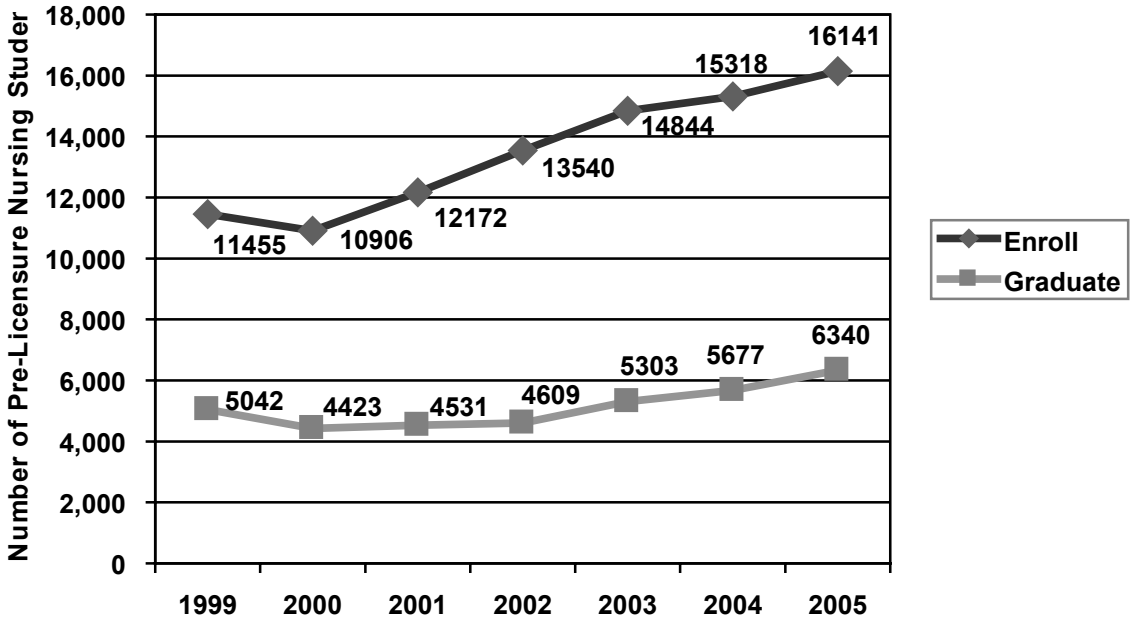
Some of the effects of the nursing shortage the hospitals reported in TCNWS' 2004 hospital nurse staffing study include: increased overcrowding of the emergency room, decreased patient satisfaction, increased patient complaints, increased waiting times for surgeries, discontinued programs and reduction in service hours, and greater difficulty in hiring RNs with two or more years of nursing experience.

Increasing Capacity and Graduation Rates in Texas Nursing Programs

The only feasible way to solve Texas' nursing shortage is to increase the number of nurses educated in Texas. The schools of nursing in Texas have been working hard to increase capacity in order to admit and graduate more students. Graduation trends from 1998 to 2004 show a 63.6 percent increase in graduates of Bachelor of Science degree nursing (BSN) programs and a 15.3 percent increase in graduates of associate degree nursing (ADN) programs. The total enrollment and graduation trends depicted in Figure 1.1 show the enrollment and graduation rates from 1999 through 2005. However, in a study done in 2005 by the Texas Higher Education Coordinating Board, approximately 4,220 qualified applicants were denied admission to the state's initial RN-licensure programs, which represented 34 percent of total applicants during academic year 2003.[3] This is an indication the demand exceeds the capacity of nursing schools to educate more students. Factors such as the shortfall of nursing professors created by an aging cohort of faculty (discussed in more depth in Chapter 2), non-competitive faculty salaries, and insufficient funds to hire more faculty members all impact the capacity of Texas schools of nursing to admit more students.

Figure 1.1.

Total Enrollment & Graduation Trends in Professional Nursing Programs in Texas 1999 – 2005



Data Source: Texas Board of Nurse Examiners
Prepared by: Texas Center for Nursing Workforce Studies, Center for Health Statistics, Department of State Health Services
Date: May 2006

Note: The enrollment and graduation numbers reflect the number of pre-RN licensure students (unlicensed students, paramedics and LVNs) who were enrolled and graduated from diploma, associate degree and baccalaureate degree nursing programs in Texas.

The Texas Center for Nursing Workforce Studies (TCNWS) conducted a statewide study in 2004 with 78 Texas schools of nursing that prepare entry-level RNs upon completion of the nursing program.[4] The 50 schools of nursing that participated in this study reported most applicants for faculty vacancies came from in state rather than out-of-state. The faculty vacancy rate in 2003 was six percent or 84 vacant budgeted FTE positions. The highest vacancy rate in Texas occurred in 2002 with 6.7 percent (97 vacant budgeted FTE positions). In the National League for Nursing's 2002 survey, the national vacancy rate was 5.6 percent. For Texas, this means if the vacant faculty FTE positions had been filled in 2002 and there were two admissions during that academic year, an additional 1,894 more pre-licensure students could have enrolled in professional nursing programs. In TCNWS' study, faculty positions remained vacant on the average from 37.5 - 39.2 weeks. This is equivalent to an academic year. In addition to the faculty vacancy rate, the overall faculty turnover rate from 1999 to 2003 for all the pre-licensure professional nursing programs in Texas ranged from 14.2 – 15.5 percent. The most frequent reason for the faculty resignations was to work in a clinical facility where salaries were higher. The most frequently cited reason applicants declined an offered faculty position in both ADN and BSN programs was insufficient salary. These findings reflect the impact salaries have on the recruitment and retention of nursing faculty.

In TCNWS' 2004 study, a comprehensive comparison analysis was done on Texas ADN and BSN faculty salaries with national average and median salaries reported for other nursing positions. The results reported in the 2004 TCNWS study and the 2004 Texas Higher Education Coordinating Board's report show median nursing faculty salaries in Texas are lower than the median salaries earned by nurses in clinical and administrative practice.

Another component that affects the faculty shortage is the number of master's and doctoral prepared nurses in the workforce. In 2004-05, there were 620 MSN and 24 doctoral graduates. Of the MSN graduates, 14 focused on nursing education. This reflects a decrease of 12 nursing education graduates when compared to 2003-04. With a large cohort of nursing faculty planning to retire within the next 12 years, there needs to be a larger pipeline of master's and doctorate prepared nurses prepared in nursing education.

When faced with a shortage of registered nurses, the obvious answer would seem to be to channel resources into the type of nursing education that produces RNs in the shortest period of time. That however neglects one vital fact. A larger percentage of baccalaureate prepared RNs go on to earn masters degrees and doctorates than ADN and diploma prepared RNs. In 2006, of the 13,492 masters prepared nurses actively practicing in nursing, 58.3 percent had initial education at the BSN level as compared to 18 percent of the diploma and 20 percent of the ADN prepared nurses. Of the 1,158 doctorate prepared nurses, 56 percent were initially educated at the BSN level as compared to 24 percent of the diploma and 18 percent of the ADN prepared nurses. It is these advanced degreed nurses who will be nursing managers from the unit-level to the top healthcare administrative levels, nursing specialists for advanced practice, and finally instructors who will educate the next generation of nurses. The American Organization of Nurse Executives, in light of the increasing complexity of health care, believes the nurse of the future is best prepared at the baccalaureate level.[5] This is supported by research studies such as Aiken, et al.'s study which showed with each 10 percent increase in the proportion of BSN prepared staff nurses, there was an associated five percent decline in mortality following common surgical procedures.[6] Thus, funding and resources are also needed for nursing programs to prepare more BSN and advanced degreed nurses.

In response to S.B. 132 in the 79th Regular Legislative session, the Texas Higher Education Coordinating Board (THECB) is conducting a statewide study to determine the graduation rate and to identify successful strategies to increase the graduation rate in professional nursing programs. The results of this study will be reported to the Texas Legislature by January 1, 2007. A statewide summit of all the professional nursing programs is also scheduled for 2007. In this summit, the results of the THECB study will be discussed along with how nursing programs can develop and implement strategies to increase capacity and graduation rates.

There are currently 94 professional nursing programs in Texas. Forty-three of the 56 ADN programs admit both pre-RN licensure students and licensed vocational nurses (LVNs) to their programs. There are six LVN-to-ADN track programs that only enroll LVNs. Thirteen of the 56 ADN programs also admit paramedics along with pre-RN licensure students and LVNs. Sixteen of the 25 BSN programs have an RN-BSN track, and there are four BSN-RN programs that only enroll RNs. There is one alternate entry/basic master's degree nursing program that offers an MSN degree to unlicensed students with degrees in other non-nursing areas. This reflects a number of nursing programs are offering opportunities for students to continue their education and progress up a nursing career ladder. Thus, it is important for state agencies such as the Texas Higher Education Coordinating Board and the Texas Board of Nurse Examiners to encourage educational institutions to add appropriate accelerated degree programs at all levels of nursing.

Many hospitals throughout the state have been valuable resources to nursing programs in such areas as providing scholarship funds, stipends and flexible work schedules for nursing students, clinical preceptors and instructors, and use of facilities and equipment for clinical learning for the nursing students. Through the Texas Hospital Association, hospitals have been effective advocates for more state funding for nursing education for the past three legislative sessions.

Innovations in Nursing Programs

The Texas Higher Education Coordinating Board (THECB) has been authorized to use some of the funds awarded to Texas as the result of the Tobacco lawsuit. The Nursing Innovative Grant Program provides competitive grants to professional nursing programs to encourage them to create innovative solutions to recruit and retain nursing students and faculty. The awarding of these grants have provided financial resources for some of the nursing programs to use computer and information technology to develop more meaningful educational and clinical experiences for the students, develop ways to help at-risk students to be more successful in their nursing education, and implement a system to make the nursing courses more accessible to students so they do not have to go to the main campus for their classes.

In 2004, two $300,000 - $2 million Nursing Innovation grants were awarded to the University of Texas Health Science Center-Houston (UTHSC-H) and Midwestern State University (MSU). The THECB was soliciting innovative educational initiatives that: 1) would increase enrollment capacity through creative and efficient use of existing and new faculty, 2) if successful, could be applied easily and cost effectively to other nursing programs on a statewide or regional basis, 3) have key collaborations with private and/or public entities including another nursing program that offered an initial RN-licensure at a different educational level, and 4) have strong research and evaluation components.

UTHSC-H is currently testing an alternative, broad-scale clinical preceptor model designed to use existing faculty resources, expand the clinical sites for nursing students to use and increase enrollments in nursing programs in the Houston/Gulf coast region. Computer and information technology is being used to train 200 clinical preceptors from 16 hospital partners and to serve as a resource for accessing course materials as well as Internet databases. They will evaluate if the following estimated outcomes occur: 1) prepare an estimated 160 – 170 initial RN-licensure students as well as or better than traditional clinical groups; 2) create a regional, standardized program for certification of 200+ Academic Preceptors eligible to serve the needs of any Gulf Coast area nursing program; 3) Increase by 160-170 the number of clinical slots provided by participating hospitals; 4) enroll 10 percent of the 200 preceptor nurses in an advanced degree or certification program; 5) improve retention of precepted nursing students versus traditional group students by 10 percent; 6) standardize electronic clinical paper work required of students among nursing programs in the Gulf Coast region; and 7) create a data base to manage student tracking and scheduling challenges inherent in this model.

MSU is developing a regional interdisciplinary simulation center that will be shared by a regional health care system and ADN and BSN programs in the North Texas area. A computerized simulation center will be developed to teach and validate competencies for nursing and allied health students and health care professionals. In this project, MSU plans to increase enrollment in the BSN program. They will conduct a research study to see: 1) if nursing faculty's time will decrease in teaching of basic nursing skills, health assessment skills and clinical decision making; 2) if the use of the regional simulation center will reduce the time requirement for validation of clinical competencies of the new graduate; 3) if students' perceptions of clinical competence differ before and after implementation of the regional simulation center; and 4) if there is evidence of cost effectiveness in teaching and validating competencies of nursing students by using the regional simulation center.

One of the components of these Nursing Innovative grants was to encourage collaboration and partnership between nursing programs and health care organizations. It supports the concept of developing regional nursing centers of educational excellence that facilitate the use and evaluation of best educational practices, new educational models and teaching strategies, innovative programs including the use of technology and information systems, and overall efficiencies of educational programs.

In 2005, the Texas Nurses Association appointed a task force to study how nursing education can be redesigned to meet future needs in Texas. One of the areas identified was the development of regional education centers that link professional nursing education programs, health care institutions and private stakeholders in a particular region of the state in order to increase recruitment and graduation of nursing students and increase capacity of the nursing programs. The Nursing Education Redesign Task Force envisioned these regional partnerships would promote the following:

- Strong communication between practice and education;
- Shared resources such as faculties and their expertise and shareware or shared information technology infrastructure;
- Shared basic core nursing content/curriculum based upon regional standards of care;
- Consistent collection of learner data by creation of a data repository for use in tracking workforce needs and in educational research in collaboration with the Texas Center for Nursing Workforce Studies;
- Strong and effective utilization of consistent preceptor/student relationships during the educational process where possible;
- Assurance of preceptor support/training/reimbursement for their contributions to the educational process;
- Transition support for new graduates built upon residency/internships similar to medicine;
- Shared resources and collaboration between practice and education for competency assessment of nursing students, new graduates and nurses in clinical practice; and
- Support from and collaboration with regional WorkSource Boards.[7]

Regional collaboration and partnership does exist in some parts of Texas such as in the Gulf Coast region and the Dallas/Fort Worth area. THECB has been facilitating more regional collaboration and partnership through their Nursing Innovative Grant Program. This program has also provided incentives and funding for nursing programs to develop creative, innovative strategies to increase the number of entry-level students that graduate from nursing programs and to recruit and retain nursing faculty. In order for nursing programs to continue to be innovative through the use of technology, preceptors, simulation, and partnerships with healthcare organizations and others, financial support such as with the Nursing Innovative Grant Program and auxiliary/capital funds, like the Health Education Auxiliary Funds, should continue to be available for nursing programs.

Patient Safety and Promoting a Healthy Workplace Environment

During the 79th Regular Legislative session, Texas S.B. 1525 was the first state legislation in the United States to become law requiring hospitals and nursing homes to implement a safe patient handling and movement program. This legislation became effective January 1, 2006. This legislation requires hospitals and nursing homes to develop and implement strategies including the use of assistive devices to control risk of injury to patients and nurses associated with the lifting, transferring, repositioning or movement of a patient.

In November 1999, the Institute of Medicine (IOM) released a report entitled *To Err Is Human: Building a Safer Health System*, which concluded that 44,000 – 98,000 people die each year in hospitals due to preventable medical errors. The report grabbed the attention of the American public and spurred public and private organizations to focus their attention on improving the quality of health care in the United States.[8] The Kaiser Family Foundation, the Agency for Healthcare Research and Quality and the Harvard School of Public Health conducted the National Survey on Consumers' Experiences With Patient Safety and Quality Information among a randomly selected nationally representative sample of 2,012 adults 18 years or older.[9] The following are some of the key findings reported as it pertains to patient safety, nurses and physicians, the healthcare environment and use of technology:

- Among the 34 percent of the people who had experienced medical errors, 72 percent reported physicians had a major responsibility for the error; 39 percent reported the institution had a major responsibility for the error; and 28 percent reported nurses had a major responsibility for the error;
- Among the 34 percent of the people who experienced medical errors, 11 percent indicated they sued a health care professional for malpractice and 14 percent who had experienced a medical error with serious health consequences reported they sued a health care professional for malpractice;
- The sample population perceived some of the following as very important causes of medical errors:
    - Overwork, stress or fatigue of health professionals (74% of participants reported as a very important cause),
    - Not enough nurses in hospitals (69%),
    - Health professionals not working together or not communicating as a team (68%),
    - Lack of computerized medical records (46%); and

- The sample population reported some of the following as very effective in reducing preventable medical errors:
    - Giving physicians more time to spend with patients (79% of participants reported as a very effective solution),
    - Requiring hospitals to develop systems to avoid medical errors (72%),
    - Increasing the number of hospital nurses (67%),
    - Reducing the work hours of physicians in training to avoid fatigue (66%),
    - More use of computerized medical records and computers instead of paper records for ordering drugs and medical tests (51%).

A study conducted by IOM was done to identify the key aspects of the work environment for nurses that likely have an impact on patient safety and potential improvements in health care working conditions that would likely increase patient safety. The findings of this study can be found in IOM's 2004 report on *Keeping Patients Safe: Transforming the Work Environment of Nurses*.[10] This report indicates that "2.8 million licensed nurses and 2.3 million nursing assistants providing patient care in the United States represents approximately 54 percent of all health care workers and provide patient care in virtually all locations in which health care is delivered… Nurses are the health care providers people are most likely to encounter; spend the greatest amount of time with; and, along with other health care providers, depend on for their recovery."[11] IOM reported several research studies that showed nursing actions, such as ongoing monitoring of patients' health status, are directly related to better patient outcomes including prevention of errors against patients. For example, a study of medication errors in two hospitals over a six month period found nurses were responsible for intercepting 86 percent of all medication errors made by physicians, pharmacists and others involved in providing medications for patients before the error reached the patient.[12] The 2004 IOM report cited several research studies that provided evidence leaner nurse staffing is associated with increased length of stay, nosocomial infections and pressure ulcers. Additional studies have also provided evidence of greater number of patient deaths are associated with fewer nurses to provide care,[13] and less nursing time provided to patients is associated with higher rates of infection, gastrointestinal bleeding, pneumonia, cardiac arrest and death.[14]

The 2004 IOM report indicates piecemeal approaches will not be successful in redesigning work practices and organizational systems in order to minimize errors. "Additional defenses against human errors can be developed and put in place only if nursing staff are not afraid of reporting these errors and involved in designing even stronger strategies to prevent occurrence of future errors." M.D. Anderson Hospital in Houston, Texas, is currently conducting a pilot project to create

a non-punitive environment for health professionals to be able to report errors. Their preliminary findings are showing many of the errors are due to organizational system-type problems and work processes; and by addressing these problems, future errors can be prevented. They have also found the use of information technology with their electronic health records and other work processes have had an impact on decreasing errors and promoting patient safety.[15]

Research studies were cited in the 2004 IOM report that showed a relationship between excessive hours worked by nurses with an increase in patient care errors. These research studies provided evidence prolonged work hours and fatigue negatively affected work performance. The research findings showed "the risks of making an error were significantly increased when work shifts were longer than 12 hours, when nurses worked overtime, or when they worked more than 40 hours per week."[16] In a more recent study done with critical care nurses, extended work hours significantly increased the risk of errors and near errors and supported the Institute of Medicine's (IOM) recommendation that limits should be placed on the hours nurses work.[17] The IOM recommended to minimize the use of 12-hour shifts and to limit nurses' work hours to no more than 12 consecutive hours during a 24-hour period and 60 hours in a seven-day period. This recommendation on limiting hours worked was directed to nurses involved in direct patient care, including clinical supervision.

The Texas Nurses Association (TNA) conducted a survey by email to 7,100 nurses of which 957 TNA members, 905 non-members, and an additional 1,000 nurses and nursing students responded. The results of the survey showed "broad consensus that there should be limits on the hours nurses can safely deliver care, and that nurses should not be permitted to work more than 16 hours per 24-hour period or 60 hours per seven-day period."[18] TNA's House of Delegates adopted a resolution that established limits on work hours for nurses and nursing students who provided direct patient care or exercised clinical judgment affecting direct patient care. In addition, TNA will advocate for nurses and nursing students to be educated about the dangers of fatigue and working excessive hours as a critical component of setting limits on hours worked.

Another issue that involves safety and the workplace environment is the issue of violence in the workplace. According to the Bureau of Labor Statistics in 2004, 11,790 health care and social service workers (or 10.7 per 10,000 full-time workers) reported work place assaults, and 19 were killed by homicide on the job.[19] The Bureau of Labor Statistics also reported among all American workers, health care and social service workers have the highest rates of non-fatal assault injuries in the workplace. In a 2004 study done with a 745 representative sampling of RNs in Texas, between 15 percent and 25 percent of the RNs reported an increase in workplace harassment by doctors, patients and other staff; and 13 percent of the RNs reported an increase in violence against nurses.[20]

This is an area where policies and strategies for preventing workplace violence toward health care workers as well as effective interventions need to be developed.

The Department of State Health Services is in the process of revising its hospital licensing rules. Section 241.029, Health and Safety Code, requires hospitals have policies relating to workplace violence and safety in the work environment for nurses. One of the areas being considered are rules that explicitly require hospitals to develop, implement and enforce such policies. There are also plans to develop rules that require hospitals to develop, implement and enforce the safe patient handling policies required by Section 256.002, Health and Safety Code.

Nursing Workforce Recruitment and Retention Strategies

All of the areas discussed in the Nursing Workforce section of this *2007-2008 Update* impact on recruitment and retention of individuals to the nursing workforce. To address the nursing shortage, complex strategies would need to be developed and implemented. The solutions need to be long-term and directed at both recruitment and retention of nurses.

Recruitment refers to the ability to continuously attract individuals into the nursing workforce. In order to increase the supply of nurses, some recruitment strategies include the following:

- Provide public service announcements, advertising campaigns and promotions to encourage more people to enter the nursing profession. The $20 million "Campaign for Nursing's Future" undertaken by Johnson & Johnson has been successful in increasing the number of people entering the nursing profession.
- Starting with elementary school-age children and continuing through all grade levels, inform children about nursing, what the benefits are to being a nurse, and what they need to do to prepare to be a nurse. Provide opportunities for school-age children to participate in health profession tracks in school, become prepared as nurse assistants, or be mentored by nurses.
- Target underrepresented and nontraditional groups, such as minorities and men.
- Address the issues confronting nursing programs that prevent these programs from increasing capacity, admitting and graduating more nursing students, and meeting the need for more qualified, competent nurses. One of the major areas that needs to be addressed is the recruitment and retention of qualified nursing faculty. Factors that impact the ability of nursing programs to increase their capacity and recommendations for addressing these issues can be found in the Texas Center for Nursing Workforce Studies' *Increasing RN Graduates: Admission, Progression, and Graduation in Texas Schools of Nursing 2004*. [21]

- Improve financial aid and help provide other sources for financial support in the form of scholarships, loans, and work opportunities as a student nurse, not only to cover for tuition, but also for other educational costs such as textbooks, uniforms, travel to school and clinical facilities, and child care.
- Encourage nursing programs to use successful strategies to increase the graduation rate in their programs.
- Provide resources to assess and help at-risk students prior to admission to a nursing program and to help at-risk students to be successful during their nursing educational preparation.
- Provide resources and regulatory support to allow nursing programs to create innovative solutions to increase the number of entry-level students that graduate from nursing programs.

Retention strategies focus on both retaining current nurses and encouraging those who have left nursing careers to reenter the workforce. Some retention strategies include the following:

- Continue to improve workplace conditions and enhance the education and professional development of nurses.
    - Programs such as Magnet Recognition of hospitals, who have established an infrastructure and met stringent standards to enhance recruitment and retention of nurses to their facility, need to continue to be sought by more hospitals. The Texas Nurses Association began a Nurse-Friendly™ designation program to help improve retention of nurses in rural hospitals and is now also providing this opportunity to metropolitan hospitals. A Nurse-Friendly™ designation program for long term care facilities will be established in the future.
- Provide safer working conditions for nurses, including maintaining appropriate staffing ratios, prohibiting long work hours that jeopardize the nurse's ability to provide safe patient care, and establishing policies and strategies to prevent and address harassment and violence in the workplace.
- Continue to increase wages for nurses to be adequate for the work and services they produce.

In the 2004 survey of Texas RNs conducted by the Regional Center for Health Workforce Studies, registered nurses indicated they:

> ...want to take care of patients safely and perform work that they find to be both satisfying and exhausting. The physical effort of tending an increasingly obese and demanding patient population, paired with extended shifts and limited assistive personnel interfere with their perceived mission and may overwhelm their enthusiasm for the profession. They are asking for assistance with and support for their work so that they may have the opportunity to deliver the highest quality of health care their skills can create. Finally, they are asking to be respected as professionals whose input is taken into serious consideration when decisions are made at the unit and organizational levels.[22]

II. UTILIZING TECHNOLOGY TO IMPROVE AND ENHANCE THE TRAINING AND COMPETENCIES OF THE HEALTH WORKFORCE

Introduction

The current healthcare workforce uses more technology now than in the past, but as more advanced systems are implemented, healthcare professionals must continue to adapt and be re-trained to take advantage of these new technologies. The education and training of new healthcare professionals must be modified to include more health information technology (HIT) to ensure they have the appropriate skills after graduation to practice safely and effectively in this new environment. A recent report states "a work force capable of innovating, implementing, and using health communications and information technology will be critical to healthcare's success. Conversely, without such a work force, implementations will fail or could even cause harm."[23]

America's medical research and diagnostic technology are the best in the world, but we lack the ability to get critical information to doctors and other health providers when they are treating patients. For example, handwritten medical records for one patient often exist in several different locations, and handwritten prescriptions may be misread by pharmacists or lost. Health information technology is increasingly hailed for its potential to reduce medical errors, save time for patients and providers, reduce duplication of medical procedures and administrative information, and provide more information for tracking public health problems. The federal government is one of the leaders of this effort, stating that, "we need to bring every doctor, outpatient office, hospital, and nursing home into the information age."[24]

The Institute of Medicine (IOM) noted "(i)nformation technology is poised to bring about a significant transformation in the nation's health system, with the Internet serving as a major agent

of change....(T)he automation of clinical, financial, and administrative transactions is essential to improving quality, preventing errors, enhancing consumer confidence in the health system, and improving efficiency."[25] The healthcare system in the United States is actually many separate healthcare systems, most of which are not integrated and do not communicate with each other, thus often leading to fragmented care and poorer outcomes for patients who switch between systems or could benefit from multidisciplinary care.[26] Information technology is the means for integrating these systems and improving care.

Information technology has changed and continues to change United States industries, but the healthcare field has not kept pace. In the late 1990s, most industries were investing an average of $8,000 per worker on IT, while the healthcare industry was spending only about $1,000 per worker. Implementation of health information technology could reduce healthcare costs by as much as 20 percent a year through reductions in duplication, waste, and inefficient use of time.[27]

The healthcare workforce includes many different types of providers and personnel such as physicians, physician assistants, nurses, dentists, pharmacists, chiropractors, physical therapists, home health workers, technicians, medical transcriptionists, and medical coders. Widespread use of HIT will change the way every healthcare job is performed, and the workforce will need to bridge the gap between current skills and skills needed for the future. Information will increasingly be digitized, and even direct care providers will need to know how to do new tasks, such as accessing and modifying patients' electronic medical records as well as knowing the laws and standards for keeping records secure.

Preparing the Nursing Workforce

In 2003, the Institute of Medicine (IOM) published a report on *Health Professions Education: A Bridge to Quality*. In this report, the following five core competencies were identified as needed for all health care professionals in the 21st century:

- Provide patient centered care;
- Work in interdisciplinary teams;
- Employ evidence-based practice;
- Apply quality improvement methods; and
- Utilize informatics to communicate, manage knowledge, mitigate error, and support decision making using information technology.[28]

The IOM reported medical schools were more likely to embrace informatics[29] than nursing and allied health schools, probably due to the differences in resources between academic medical schools and the community colleges and smaller schools where the majority of nursing programs and allied health programs are located. IOM emphasizes "interacting with computing resources in the educational processes is not the same as applying informatics to patient care. Informatics are not better integrated in health professions curriculum, in part due to the lack of understanding of informatics as a discipline, limited support from administrators and faculty, lack of easy access to local experts, insufficient time for faculty to develop new teaching skills, and no room in the existing curricula."[30]

The National League for Nursing (NLN) is currently conducting a national survey of nursing program administrators and faculty to determine how nurses are being prepared to practice in an ever increasing, informatics-rich, health care environment that requires the use of information technologies for clinical decision-making and the provision of safe, quality care. NLN's goal is to identify how nursing programs are preparing the next generation of nurses and to identify exemplars as well as gaps. The results will be shared with the academic community in a White Paper that will include recommendations and exemplars.

The National Advisory Council on Nursing Education and Practice advises the U.S. Department of Health and Human Services on developing the registered nurse workforce. This council convened a panel of nursing informatics specialists from around the country called the National Nursing Informatics Work Group. This work group developed the National Informatics Agenda for Nursing Education and Practice, which consists of the following five recommendations and goals for informatics and how the federal government can help:

1. ***Educate nursing students and practicing nurses in core informatics content.*** Federal resources should promote the inclusion of core informatics skills and knowledge leading to competency in nursing undergraduate, graduate, and continuing education programs.

2. ***Prepare nurses with specialized skills in informatics.*** Federal funds should support innovative nursing and health informatics programs that teach specialized informatics skills needed to develop information technology that supports the national health goals of providing accessible, high quality, and cost-effective care.

3. ***Enhance nursing practice and education through informatics projects.*** The Federal government should fund innovative, collaborative telecommunication projects that would enhance the quality of clinical practice for populations at risk and contribute to the education of health care providers.

4. ***Prepare nursing faculty in informatics.*** Federal resources should support increased nursing faculty preparation in informatics through the use of collaborative programs and technology.

5. ***Increase collaborative efforts in nursing informatics.*** Federal resources should support efforts to facilitate the advancement of informatics in nursing through collaboration among public and private organizations.[31]

Preparing the Primary Care Workforce

Although there is general agreement increased development and utilization of health information technology (HIT) could mitigate many problems with the U.S. health care system, there is less agreement about how the United States should organize and implement an HIT infrastructure.[32] Primary care may be the best place to start. Most office visits are to primary care providers, and primary care providers play an integrative role particularly well suited for demonstrating the usefulness of HIT. Indeed, other nations that have successfully implemented HIT have started with primary care.[33] While health care consumers are already accustomed to electronic commerce and are generally ready to embrace HIT, other stakeholders are still grappling with fundamental issues such as data standards, privacy, security, and costs. Many efforts are underway to address these issues, but full-scale implementation and usage of HIT by primary care providers in the United States is probably several years from realization.

Benefits

HIT can help with a variety of clinical and administrative activities typically conducted in physician practices. Patients and clinicians have described benefits including greater flexibility and efficiency in scheduling, communication, prescribing, disease management, chart review, and education.[34] Many of these benefits have the potential to produce cost savings or increased revenue. For example, implementation of HIT could lead to decreased costs in compensation for medical records and other support staff, decreases in transcription and paper supply costs, increased revenue from visits due to reduced provider time per visit, and higher payment from increased levels of coding for visits because electronic health records (EHRs) enable more complete documentation of visits.[35] EHRs can even help save space, because not as much space is needed for patient records.[36]

Patient satisfaction is another possible benefit of HIT. One study examined patient satisfaction with outpatient primary care visits after computers were introduced at the point-of-care (in the examination room). When patients were queried seven months after implementation, they were

more satisfied with physicians' familiarity with patients, communications about medical issues, and comprehension of decisions made during the visit. They were also more likely to report the computer helped the visit run in a more timely manner.[37]

Current Usage

Even though there are many possible benefits from using HIT in primary care settings, recent estimates indicate only approximately 27 percent of physicians in the United States currently use HIT in the form of electronic health records. This percentage is significant, but is low compared to many other industrialized countries.[38]

Practice size is one of the most important factors affecting utilization. In one study, 57 percent of physicians in practices with more than fifty physicians used an EHR, compared with only 13 percent of solo practitioners.[39] Another study found only 11.3 percent of practices with ten or fewer physicians had fully implemented EHRs.[40] Any successful strategy for deployment of EHRs on a large scale will have to address the factors affecting usage at these small practices, which account for four-fifths of all physicians and 88 percent of all outpatient visits.[41]

Barriers

Standards and Interoperability – Perhaps the most fundamental barrier to implementation of HIT is the lack of consistent data standards. Currently, most EHRs do not interoperate well with other applications, such as applications for laboratory or radiology results, medication lists, and other clinical information. Standardization of data formats is a key stepping stone.[42] Such standards must address "secure transport over the Internet and other networks, . . . secure connectivity, reliable authentication, and a suite of defined interchange formats for health care data."[43] Until standards are in place, vendors are at risk of developing systems that will soon be obsolete, and providers are at risk of implementing systems that will not be compatible with future requirements. Providers are also at risk of not being able to support their systems and not being able to move their data easily to another vendor if necessary. The possibility exists "hundreds of well-intentioned—and even locally successful—information networks will never be able to exchange information with each other."[44]

Privacy and Security – Other than the requirements of the Health Insurance Portability and Accountability Act (HIPAA), "there are no uniform agreements about security or privacy of health information across a network."[45] Privacy and security tend to be important issues for the public. While security may actually be better with EHRs than with paper records, breaches of security can

be more catastrophic with electronic records.[46] To address the concerns of the public, many models are premised on patient authorization and control, so patients are able to choose whether or not to participate in sharing personally identifiable information.[47]

Costs – HIT might already be widespread in primary care settings if not for barriers related to cost. Costs include "hardware, software, information systems staffing and external contractor services, installation, training, abstraction, productivity loss, and telecommunications."[48] In one study of physicians' practices that had implemented electronic medical record systems, initial costs ranged from $16,000 to $36,000 per physician.[49] In addition to hardware and other initial startup costs, there are temporary costs related to lost productivity as physicians and office staff learn the system. During this startup phase, the physician may not be able to see as many patients, and fewer patients means less revenue.[50] Technical support and training are needed in order to minimize lost productivity, but these create additional costs.

Most primary care is delivered in small practices, and startup costs hit primary care providers particularly hard because the cost of implementing an HIT system is much higher per full-time physician in small practices than in larger settings.[51] Because small practices often struggle financially, they may have a hard time justifying any investment, especially if the returns are uncertain.[52] In a study of 14 solo or small-group primary care providers using electronic health records, "the average practice paid for its EHR costs in 2.5 years and profited handsomely after that; however, some practices could not cover costs quickly, most providers spent more time at work initially, and some practices experienced substantial financial risks."[53]

Addressing Barriers

Common Framework – Systemic barriers related to standards, interoperability, privacy, and security require a large-scale, coordinated effort to establish a common framework for HIT. The benefit of a large-scale, coordinated effort is it can provide strong leadership, clear objectives, effective communication strategies, and proactive change management.[54] A large, multistakeholder collaborative called "Connecting for Health" is currently advancing this "Common Framework" approach. The collaborative recommends a public-private "Standards and Policy Entity (SPE)" be established to identify, interpret, and disseminate "policies and bundles of standards necessary for sharing electronic health information." The SPE would also promulgate "detailed implementation guides . . . to help users 'connect the dots' between the status quo and the desired outcomes."[55]

Local and Regional Development – A common framework with clear policies and interoperability data standards at the national level will provide the structure within which local and regional development can proceed. As with banking, the goal is not to create a single monolithic system

that serves as a repository for all health records in America. Rather, the goal is to allow "efficiency, flexibility, creativity, progress, [and] customer-benefiting service differentiation strategies" within the common framework.[56] An "incremental and decentralized approach" reduces the risk involved and allows patients and their physicians to have more control over their health records.[57]

Financial Incentives – The most important barriers for primary care physicians, especially those who have small practices, are related to cost. The federal government and other payers must consider ways to provide financial incentives or to cover some of the risk involved in adopting HIT systems. Because of its size and influence, Medicare could have the greatest opportunity to influence physician practices. Approximately 700,000 physicians participated in Medicare in 2004. A Medicare-sponsored HIT incentive and financing program could have tremendous influence on the uptake of HIT.[58] For example, Medicare could pay providers more if they use electronic health records, submit electronic data, or reach specific benchmarks for implementing HIT. The government could also support primary care providers by providing guarantees that a vendor is aligned with national standards.[59]

Conclusion

Primary care providers and members of the U.S. public seem ready to embrace HIT, but want to be assured necessary standards, incentives, and safeguards are in place. Primary care providers, especially those in small practices, face significant barriers related to the cost of implementing HIT systems, while members of the public have serious concerns about the privacy of their personal health information. A national, public-private collaborative effort is necessary to establish a "common framework" for data standards, interoperability, privacy, and security as well as to provide leadership and proactive change management. A well-organized national effort will provide a structure that supports creativity and flexibility at the local and regional levels. Meanwhile, the federal government and the Medicare Program can play a unique role in providing incentives to influence the wide-scale uptake of HIT across the nation.

Preparing the Physician Workforce

"*See one, do one, teach one*: This simple set of phrases has characterized medical education and training for over 4,000 years. Today's physician is largely the product of an apprenticeship program that uses patients in hospitals as the primary elements of the classroom. Little changed in the past century to affect this traditional process. During this same century, however, we saw both the invention of the airplane and the maturation of flight simulation as the primary training

tool for the aviator. Today, every commercial pilot masters a new aircraft in simulation. We have reached the point where the best flight simulators are virtually indistinguishable from the real thing."[60]

To address the emerging practicality of virtual simulations, the Association of American Medical Colleges (AAMC) established the Virtual Patients Reference Center to provide an inventory of virtual patient applications for their member schools. "Virtual Patients are computer-based simulations that use technology to bring patient cases to life. Because of their media-richness and complexity, virtual patients are expensive and resource-intensive to develop. As a result, few schools can afford to create these valuable learning tools. The AAMC has developed this Virtual Patients Reference Center to promote sharing so all member medical schools might benefit and educators might collaboratively create additional cases rather than duplicate efforts across institutions. For the purposes of the inventory, virtual patients are defined as interactive computer programs that simulate real-life clinical scenarios in which the learner acts as a health care professional obtaining a history and physical exam and making diagnostic and therapeutic decisions."[61]

Another example of addressing the "emerging practicality of virtual simulations" is the Virtual Patient Project at the Carl J. Shapiro Institute for Education and Research at Harvard Medical School and Beth Israel Deaconess Medical Center. The project has approximately 50 virtual patient cases that comprise the core curriculum of medicine. "The cases planned are the bread and butter of medicine, a full range of common disorders, and the diagnostic and management decision-making trees to deal with them. These are patients who will always be available when a student has the time. There's a lot we don't know about this approach. Is it effective? Is it worth the time and the expense to produce each case, about $150,000 to $250,000? Does it address the different learning styles of the students?"[62]

Dr. Michael Rosenblatt, Dean of Tufts University School of Medicine states managed care has removed the hospital as the superior location for clinical education. "The hospital has become a huge intensive care unit. Only the very sick or those with severe forms of diseases are in the hospital, and many arrive with the diagnosis already made. The rest are outpatients. There is no longer the luxury of time for a medical student to interview and examine a patient the day before surgery. Patients are admitted the same day as their surgery and often go home that day. In the hospital, there is little time to teach any but the most technical aspects of surgery. Certainly, there is not much time to connect to the patient as a human being. In the outpatient setting, the meter is running. You have 20 minutes to see a patient, during which time you have to take care of the patient, teach the student something about the pathophysiology of, say, diabetes and regulating blood sugar with insulin, and also serve as a role model for how to get information and connect

with the patient. It is impossible to do all that in 20 minutes. In 20 minutes, an experienced clinician can do a focused interview and targeted exam, but for students, it's like asking them to run before they can walk. We have to find some new ways to address the challenges. One way is to use technology through virtual patients and simulator programs."[63]

Studies have shown "physicians tend to generate only one question for every two to three patients encounters, only actively pursue answers to about 30% of questions generated, and use either a content expert or printed resource. Given further evidence traditional continuing medical education fails to alter behavior, and learners retain little from lecture formats and then only retain it if they use it immediately, the authors make a strong case for pursuing learning at the point of care. To investigate a hypothesis that current students, being more computer-oriented, might seek and use more computer-based data at the point of care, the authors monitored 116 students use of a digital textbook UpToDate. Previously, these students had received lectures and case-based learning exercises as part of their pre-clinical training. Their use of UpToDate was monitored for 12 months prior to their clerkships in which they continued to receive didactic instruction and also saw patients. After their first year of clerkships, they completed a questionnaire regarding their use of electronic resources. Results indicated students were using the electronic resources in conjunction with patient care rather than in preparation for didactic instruction exams. More than 85 percent of respondents identified electronic sources as their primary resource, that they used them daily, and they spent less than 15 minutes answering a clinical question.[64]

How does online continuing medical education (CME) activities compare to live, in-person CME activities? Authors of a study "compared the behavioral outcomes of two approaches to CME. Both approaches produce outcomes that were both positive and similar in terms of immediate change and 12-week-later change. They conclude appropriate-designed, evidence-based, online CME can produce objectively measured changes in behavior as well as sustained gains in knowledge that are comparable or superior to those realized from effective live activities."[65]

How can technology improve the day-to-day functions of medicine? Implementing electronic prescriptions is one major answer. "The number of medication prescriptions is expected to reach almost 4 billion in 2006. This figure is approximately 14 times the size of the U.S. population. Exposure to electronic prescription communications at the earliest levels of a future physician's education and training is a must. Electronic prescribing has the potential to reduce errors, in fact, medication errors could be cut by about 55 percent if physicians switched to writing electronic prescriptions, according to a report by the Institute of Safe Management Practices. The Institute of Medicine study, *To Err is Human*, reports medication errors alone, contribute to more than 7,000 deaths annually, exceeding those resulting from workplace injury. Physicians in training should be exposed to electronic prescribing in their hospital and ambulatory experience. Medical

schools and industry should mobilize resources to ensure ambulatory training sites for students and residents are equipped with up-to-date electronic tools so the trainees can see the benefits firsthand. When they leave their formal training, new physicians will carry the need for adequate technology into their eventual practice sites."[66]

Another major benefit of implementing electronic prescribing is "increased communication between physicians and pharmacists may help address patient compliance issues related to the more than 1 billion unfulfilled prescription renewals each year."[67]

"Physicians have long been tormented by gaps in information, because their ability to assist patients is directly related to the quality and quantity of information available. Their quest for instantaneous access to "all that is known," however, will soon no longer be quixotic. The explosive growth of information technologies will enable physicians to browse a limitless virtual library, which already includes links to every paper published in biomedical science during the past three decades. Scores of time-tested medical books are appearing online on a daily basis. The online availability of a patient's complete medical record is also being realized. Soon physicians will have electronic access to lab data, narratives of office visits, and visual material, such as electrocardiograms and X-rays. Terminals linking these vast databases will be in the private office setting, on the hospital floor, and even in the car or airplane. Physicians of the future will have fingertip access to an immense amount of information that will dramatically improve the practice of medicine. With the gift of information, however, comes the responsibility of knowing how to use it. The unwary user will drown in the deluge of data. Our future physicians must learn to navigate these potentially treacherous seas and develop skills in locating, evaluating, and correctly applying information."[68]

The College of Physicians and Surgeons has begun to implement a variety of curriculum changes to teach students how to maximize data/information searches. Equally important – this information curriculum will be taught by experts in information processing.[69]

Conclusion

Critical demands will be placed on the health care workforce and the health care delivery system due to the dramatic changes occurring in the population and in the increased incidence of disease associated with that change. Leaders in primary care urge a concerted, national effort to reconstruct primary care in order to care for our increasingly older, chronically ill, and diverse population. Technology can be applied in many circumstances across the health care continuum to improve patient outcomes, while at the same time improving cost effectiveness.

Health care must become patient centered and must serve the needs of the patient. The goal of primary care systems should be the delivery of the highest quality care as documented by measurable outcomes. Quality outcomes should be prefaced on evidence-based medicine and enhanced by the use of practice guidelines and clinical guidelines. Information technology will facilitate gathering the data required to determine the guidelines and to monitor the quality.

Technology can also be utilized to help manage patients in less expensive, non-traditional settings. Home monitoring devices, some interactive, can monitor activities, such as blood pressure, cognitive function, and medication administration for individuals living in their homes.

Telemedicine and telehealth networks can be utilized to increase access to underserved areas and populations, while simultaneously improving the recruitment and retention of health care providers in these areas. Distance education can facilitate the education and training of additional health care professionals.

Information technology should be used not only to increase provider reimbursement but also to better manage patient care over time and to improve access and decrease disparities in the delivery of health care. However, care should be given to identifying and implementing technology solutions that will enhance practice workflow and be minimally disruptive to the practice.

However, as technology is utilized throughout the health care delivery system, it is imperative our health professions' educational system be prepared to adapt existing curricula to prepare both new and current health professionals to practice safely and efficiently in a technology-rich environment.

III. RECOMMENDATIONS

Texas must take the necessary steps to achieve education and training in the health professions to ensure an appropriately skilled, sufficient, and experienced workforce becomes a reality for the state. Historically, the SHCC has included health workforce policy recommendations as part of each *Texas State Health Plan* and its biennial updates. Due to the passage of House Bill 916, 79th Regular Legislative Session, that mandates the Texas Health Workforce Planning Partnership coordinate all health care workforce planning activities within the state, the SHCC voted to forward the recommendations developed as part of the *2007-2008 Update* to that body for inclusion in their strategic plan on health workforce. The reports will be available online at the following websites: http://www.dshs.state.tx.us/chs/shcc/default.shtm and http://www.governor.state.tx.us/divisions/bpp/thcpc.

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