



Elizabeth Kirk, PhD  
Executive Office of the President  
National Science and Technology Council  
4201 Wilson Boulevard, Suite II - 405  
Arlington, VA 22230

April 1, 2004

Dear Ms. Kirk,

This statement is being submitted to the President's Information Technology Advisory Committee (PITAC) by a collaboration of nurse informaticists during the public comment period prior to the open meeting on April 13<sup>th</sup>. Several of the supporting documents are also enclosed for your reference and use. This statement has been developed in response to a discussion between Kathleen McCormick PhD, RN, Dr. Jonathan Javitt and Dr. Bill Braithwaite at the PITAC open meeting at HIMSS 2004 Annual Conference and Exhibition in Orlando, Florida, on February 25<sup>th</sup>. Drs. Javitt and Braithwaite noted the lack of a nursing response to the questions being addressed. They invited nurses to prepare a response that could be used in the final report, which is scheduled for Spring 2004.

The following statement is submitted by the Nursing Informatics Collaboration Task Force (NICTF). This group was recently convened through the efforts of the Nursing Informatics Working Group of the American Medical Informatics Association (AMIA), the professional nurses represented by the Healthcare Information and Management Systems Society (HIMSS), and the American Nurses Association (ANA). The NICTF response includes input from nurse informaticists that are members of regional and national groups including the American Nursing Informatics Association (ANIA), Boston Area Nursing Informatics Consortium (BANIC), Capitol Area Roundtable on Informatics in Nursing (CARING), Delaware Valley Nursing Computer Network (DVNCN), Midwest Alliance for Nursing Informatics (MANI), Nursing Information Systems Council of New England (NISCNE), Puget Sound Nursing Informatics Association (PSNI), South Carolina Informatics Nursing Network (SCINN), and the Utah Nursing Informatics Network (UNIN).

As co-chairs of the Task Force, we are pleased to facilitate this response and to provide any additional information that is requested by PITAC members. We would also welcome an opportunity to review the PITAC final draft document.

Sincerely,

Joyce Sensmeier MS, RN, BC, CPHIMS  
Director of Professional Services  
HIMSS  
Healthcare Information and Management  
Systems Society [jsensmeier@himss.org](mailto:jsensmeier@himss.org)

Connie Delaney PHD, RN, FAAN  
Chair, Nursing Informatics Working Group  
AMIA  
American Medical Informatics Association  
[connie-delaney@uiowa.edu](mailto:connie-delaney@uiowa.edu)

**Nursing Informatics Leadership Response to President's Information Technology Advisory Committee (PITAC) Questions regarding "The New Health Care: How Information Technology is Transforming America's Health Care System"**

This statement is being submitted to the President's Information Technology Advisory Committee (PITAC) by a collaboration of nurse informaticists during the public comment period prior to the open meeting on April 13<sup>th</sup>. This statement has been developed in response to a discussion between Kathleen McCormick PhD, RN, Dr. Jonathan Javitt and Dr. Bill Braithwaite at the PITAC open meeting at HIMSS 2004 Annual Conference and Exhibition in Orlando, Florida, on February 25th. Drs. Javitt and Braithwaite noted the lack of a nursing response to the questions being addressed by the Committee. They invited nurses to prepare a response that could be used in the final report, which is scheduled for Spring 2004.

Nurses represent the largest group of organized professionals in health care in the United States. Nurse informaticists play a critical role in creating an effective health care information infrastructure. These nurse informaticists are replacing or developing clinical nursing documentation systems and clinical information systems. They are educating others in nursing informatics, and developing research agendas related to evaluating the impact of informatics on quality and nursing care (ANA, 2001). Some of these experts are purchasers of information systems in hospitals, outpatient settings, community and home care nursing environments. In a recent survey of 537 nurse informaticists, two thirds of respondents reported that systems implementation is their top job responsibility (HIMSS, 2004). In addition these nurses have implemented about one-quarter of the computerized provider order entry (CPOE) systems in the U.S.

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*The Questions.*

- 1) What are the Current Opportunities and Barriers to creating an effective health care information infrastructure?

2) What are the ROIs?

3) What Research and Development should be conducted?

*The Response:*

### **1) Current opportunities and barriers to creating an effective health care information infrastructure**

Patient safety is a well-documented priority for healthcare organizations. This focus provides an opportunity for healthcare organizations to evaluate the use of information technology and the related infrastructure to deliver safe and effective patient care. Computerized provider order entry (CPOE), clinical information systems and bar coded medication management are three top applications for healthcare organizations in the next several years as reported in the survey of nurse informaticists (HIMSS, 2004). Nurses play a critical role, as almost three-quarters of respondents are involved with the implementation of their organization's clinical information system, 52 percent with the implementation of CPOE software, and 48 percent with implementation of an EMR. The extensive clinical background of nurse informaticists is valuable, as nurses have an intimate understanding of the workflow, environment and procedures that are necessary to achieve success.

Another opportunity and potential barrier for creating an effective healthcare information infrastructure relates to leadership and a clear strategic vision (Kennedy, 2004). The complexity of creating a healthcare information infrastructure is immense and can only be developed once it has been defined. Many efforts in this direction both at the conceptual level (i.e. IOM's definition of the Computer-based Patient Record) to the detailed data level (i.e. HL7's Reference Data Model). Yet the missing link may be the discussion about how to distill this information into practical, usable models that can be applied to improve the work environment of the nurse and improve patient safety. An innovative approach is needed to create a cohesive agenda across a very dynamic, complex healthcare delivery organization. Once an "effective" healthcare information infrastructure is defined, it could be recognized and promoted from both a nursing and collaborative care model.

The survey of nurse informaticists identified financial resources as the largest barrier to success in their role of implementing health care information infrastructures. This is consistent with the responses of chief information officers (CIO's) as reflected in the 15<sup>th</sup> Annual Leadership Survey (HIMSS, 2004). Lack of user acceptance or administrative support, and software design that ignores current workflow processes were also described as barriers. Healthcare CIO's in this survey have recognized the importance of a clinical champion by identifying the need to increase IT staff to address clinical issues.

A 1997 review of information technology use by nurses suggested that barriers include: lack of integration of nursing systems within hospital information systems, the need for a

unified nursing language, and lack of point-of-care terminals (Bowles, 1997). However, more recent reviews describe that these barriers are slowly being resolved (Androwich, Bickford, Button, Hunter, Murphy and Sensmeier, 2003). Additional barriers include lack of a standard design for clinical systems that would address the inconsistency of entering or extracting data from the end user's perspective (Hermann, 2004).

In another study recently undertaken by the Interagency Council on Information Resources for Nurses (ICIRN), the information literacy of nurses was surveyed (Tanner, Pierce, Pravikoff, in press). Information literacy was identified as a nursing informatics competency for the nurse. Information literacy has been found to be an essential element in the application and use of evidence based practice (EBP). The study identified the gaps in knowledge and skills for identifying, accessing, retrieving, evaluating and utilizing research evidence to provide best practice for patients. The study also reported that over sixty-four percent (64%) of nurses regularly need information, but 43% rated workplace information resources as totally inadequate or less than adequate. The three primary organizational constraints in the practice settings were identified as: 1) the presence of other goals of higher priority, 2) difficulty recruiting and retaining staff, and 3) organizational budget for acquisition of information resources. Three personal barriers were identified: 1) lack of understanding of organization or structure of electronic databases, 2) difficulty accessing information, and 3) lack of skills to use and synthesize evidence into practice.

Findings from another study indicated that nurses at every level and role exhibit large gaps in knowledge and competencies at each step in the information literacy process--from lack of awareness that they need information to lack of access or ability to successfully search and utilize information needed for practice, particularly in an electronic format (Pravikoff, Pierce, Tanner, 2003). However, significantly more nurses who received their most recent nursing degree after 1990 acknowledged successful searches of evidence in the National Library of Medicine (NLM) Medline and CINAHL when compared with those who graduated prior to 1990 (Tanner, 2000). Thus, training in computer skills has been a barrier that may diminish with more nurses becoming computer literate in high school and college (Pierce, 2000). The "tipping point" may be a generation gap.

Most nurses did not have training regarding computer use or typing skills in their nursing or college curriculum unless they returned to school for further education after 1990 (Gloe, 2004). Therefore, the practicing nurse should be provided with opportunities for learning basic "keyboarding" i.e. typing skills and computer basics such as how to use the mouse. This would lessen the anxiety for computer use. Nurses are caring for patients with greater acuity, requiring more documentation and creating higher stress than ever before. Adding the stress of computerization when one is totally unfamiliar with the computer can be a major challenge. Incorporating this challenge into their current work load may seem like an insurmountable task to nurses and could be a large barrier for EHR implementation. Thus, providing educational opportunities as well as designing user friendly applications for use by the nursing staff can lessen the stress and remove barriers.

Summarizing an Agency for Healthcare Research and Quality (AHRQ) conference examining

quality research, the attendees asked if the primary barriers to achieving the National Health Information Infrastructure (NHII) are more political than technical. The participants identified the need for standards to govern the infrastructure, the lack of broad-based agreement among stakeholders of a system concept, and the legal concerns about privacy and confidentiality (Lang and Mitchell, 2004). Vahey, DC, Swan, BA, Lang, NM, & Mitchell, PH (2004) summarized the need for additional research on the barriers to quality improvement which they defined as: lack of standardized measures, inadequate information systems to collect data, inadequate resources to pay for data collection and translation, and technological issues. As stated by others at the same conference (Lamb, GS, Jennings, BM, Mitchell, PH, & Lang, NM, 2004) the necessary demand and incentives are currently not in place to assure the development of information infrastructures that will support quality improvement.

Finally, in a monograph sponsored by the professional specialty information association (AMIA) in collaboration with the professional nurses association (ANA) the major constraints to full implementation of the information infrastructure for nursing were identified as lack of: policy, regulation and standards, technology, information systems, human factors, technology adoption and system utilization (Androwich et al, 2003). Other barriers include lack of a positive ROI for the use of clinical documentation systems, and limited availability of applications that specifically support the work of nurses.

Many reports, such as those recently published by the Institute of Medicine, support the use of technology in reducing medical errors and encourage implementation of evidence-based healthcare practice. The results of these recent studies identify gaps and barriers that limit effecting these prescribed practices among nurses, the largest number of health care professionals who provide the greatest percentage of direct contact, time and intensity with the consumer/patient.

## **2) What are the Returns on Investments (ROIs)?**

Two types of data are available related to the ROIs of nurses utilizing information systems in the delivery of patient care. Early in the last decade, researchers began evaluating the value of computer terminals at the bedside or at the point of care. In one study of the impact of bedside terminals on the quality of nursing documentation, Marr, P., Duthie, E., & Glassman, K. (1993) found that completeness of documentation measured by the presence or absence of components of the record was better with bedside terminals. In addition they found that timeliness of documentation was improved closer to the actual time when care was delivered. Other benefits of nurses using computers to document practice were 1) the integration of care plans with nursing interventions, 2) calculation of specific acuity, and 3) automatic bills for nursing services.

Other reported studies of bedside terminals have documented the ease of use, elimination of redundant data, system support at the bedside, availability, currency of data and access to expert systems. Use of clinical information systems have been shown to provide soft benefits related to improvements in patient safety, care provider communication, and workflow enhancements. Historically there have been few studies to show hard benefits of dollars saved, or a substantial decrease in care hours. However, as more nursing focused software is implemented a positive

ROI has been noted (Curtis, K. 2004).

The Nicholas E. Davies Award of Excellence for Electronic Health Records (EHR) recognizes excellence in the implementation of EHRs in healthcare organizations and primary care practices. Established in 1995 this program has recognized 19 hospitals in the past 9 years. As part of the application process, organizations must document the financial impact of their implemented EHR. A 2001 winner, the University of Illinois at Chicago Medical Center, documented that during a two year period of time, \$1.2 million of nurse time was reallocated from manual documentation tasks to direct hands-on patient care (CPRI-HOST, 2001). Registered nurses in the charge nurse role gained 2.75 hours per shift in the medication administration process.

Data are also available on the computerization of evidence based practice recommendations. Although these data are sparse, existing publications cover a diverse range of topics from the integration of information technology with outcomes management, coding and taxonomy issues relevant to outcomes, including standardized language and other issues tied to the nursing minimum data set, and the development of nursing sensitive outcomes measures from nursing care and interventions. It has been suggested from former studies related to outcomes, that nurses should serve on multidisciplinary teams and collaborate with others in building IT systems that could improve organizational learning, use of evidence, and quality.

### **3) Recommended Research and Development Needs**

The nursing profession has both a critical mass of nurses involved in information technology, and experience with implementing technology and related systems. Yet there is a need to educate nurses involved with implementing and utilizing information infrastructures. The focus has shifted nationally from developing an information infrastructure, to using an information infrastructure to assure safe, effective, patient-centered, timely, efficient, and equitable care. Information technology is the critical tool to be used in the redesign of systems supporting the delivery of care to achieve the type of quality care recommended by the current President and the recent Institute of Medicine reports.

The nursing profession is a participant in the delivery of care in the hospital and outpatient environment, and is centrally placed in community and home care. There is a need to create centers for evaluation of the barriers and benefits of information infrastructures. These centers should be located in academic centers and/or developed in cooperation with commercial developers of information systems. These centers should be multidisciplinary and nursing focused. Nurses must be involved in these types of research and evaluation efforts.

The National Institute on Nursing Research (NINR) developed priorities for research in nursing informatics in 1993. These included: a) Formalization of nursing vocabularies, b) design and management of databases for nursing information, c) development of

technologies to support nursing practice, d) use of telecommunications technologies in nursing, e) patient use of information, f) identification of nurses' information needs, and g) systems modeling and evaluation (NINR, 1993). While NINR has funded a number of studies in these areas and achieved outcomes in advancing nursing informatics, the Institute has never received sufficient funds to disseminate the findings, translate them to practice, or expand the individual studies to the support of Centers of Excellence.

Other research has been recommended in the areas of: 1) Prototyping methodology to explore specific ways to realize innovations, 2) pilot tests of technology based innovations and new workflow processes, 3) analyses of successful and unsuccessful outcomes and change processes in the implementation of systems, and 4) demonstrations of the return on investment from nursing documentation on such areas as patient safety, errors, quality, effectiveness and efficiencies (Androwich et al, 2003).

The Health Resources and Services Administration (HRSA) Division of Nursing has funded training in nursing informatics. Enhanced budgets would provide the necessary funds to expand those programs with a focus on the literacy gaps in nursing at both the academic levels and in practice areas.

According to a workgroup report to the American Academy of Nursing Technology and Work Force Conference, the ideal nursing care-delivery system enables staff nurses to increase their productivity, job satisfaction, and the quality of care by increasing the time spent on direct care activities (Sensmeier, Raiford, Taylor, and Weaver, 2002). The report recommends that this system must include information technology that replaces the paper-based, administrative tasks with a paperless, point-of-care, computer-based patient record imbedded with intelligent, rules-based capabilities that automate the manual workflow processes, policies, and procedures, and that support the nurse's critical thinking. Research to explore these recommendations is needed.

Other target areas for practice-based research identified by the Boston Area Nursing Informatics Consortium (Kennedy, 2004) include: Workflow and workplace design for point of care applications, creating a model for systems value at the point of care, clinical systems implementation, clinical documentation and utilization of standardized nursing language, clinical systems evaluation tools, consumer health systems, web-based education and methods for evaluating applications, specifically CPOE and medication management.

The Agency for Health Care Research and Quality (AHRQ) has also funded research in nursing informatics and the impact on quality and evidence based practice. One such study demonstrated that installing a computerized medical information management system in hospital intensive care units can significantly reduce the time spent by ICU nurses on documentation, giving them more time for direct patient care (AHRQ, 2003). Follow-up studies are needed to validate these findings.

AHRQ hosted a conference where nurses helped the Agency define research priorities

The conferees concurred that the sole reason to design and implement clinical information systems was to use the information to track, interpret, and improve quality of care. They identified information systems technology as the crucial bridge to translate research into practice (Lamb, et al 2004). They suggested that a research emphasis should be placed on reducing the barriers to getting timely and credible information to the nurses. The group identified the gap between collecting data to measure quality, and using the data to improve the quality of care. They identified this as the biggest way that the return on investment (ROI) for developing systems could balance the effort expended to collect the data. Information technology supported by evidence-based practice and patient safety initiatives is key to a quality agenda. However, the information technology is available, so the barriers to achieving its benefits need to be evaluated and solutions developed so that direct providers and decision-makers can implement systems (Lamb et al, 2004).

Conference participants recommended the following research goals relative to nursing informatics: 1) Standardized quality indicators need development and measurement including nurse sensitive measures from nursing care and interventions measures, and quality indicators to link care across settings, 2) improved risk adjustment methodologies, and 3) a national health information structure to inform quality improvement efforts (Vahey, et al, 2004). They further cited the need for integration and collaboration among stakeholders in conducting research on the information systems' needs to measure quality, improvements in patient safety, and risk and error reduction.

Since nursing practice is often absent in databases and systems of reimbursement from private and public sources, other recommended research has focused on the inclusion of nursing sensitive quality indicators achieved from nursing care and interventions, in conjunction with the analysis of workforce and contributions of advanced practice nurses (nurse practitioners) (Brooten, et al, 2004). Lamb et al (2004) stressed that the critical research question in the quality initiative involves the complex analysis of the interplay between information infrastructure systems, organization, financial and clinical practice features. Not only did this group recommend that AHRQ expand their research agenda for nursing sensitive areas, but they also recommended broader dissemination of the results of the impact of nursing staffing on achieving quality outcomes.

The Centers for Disease Control and Prevention (CDC) has sponsored research in public health and biodefense information infrastructure. While nurses have been involved in implementing these programs, the impact of nursing research on these areas could benefit from additional funding.

The Centers for Medicare and Medicaid Services (CMS) provides data from which health services research nurses have evaluated the impact of nursing care on quality, effectiveness, and efficiencies. Researchers have identified that quality indicators of care from the largest group of health care workers, namely nurses, are absent in the databases and subsequently the systems of reimbursement from CMS (Brooten, et al, 2004). The utilization of cooperative agreements and contracts for evaluation of the return on



investment for nursing information systems embedded in health care information systems has not been widespread. The pilots and demonstration studies recommended above could be facilitated by CMS contracts and grants. Models of incentives could be studied to determine how CMS could include nursing documentation data in health care records to evaluate quality, outcomes, and cost impacts. Constructing nursing sensitive quality indicators from existing databases and establishing their validity needs further research. Medicare and Medicaid data are incomplete representations of nursing's contributions to quality outcomes. (Lamb et al, 2004) Lamb and colleagues further recommended that systems be created and maintained to assure that the quality data can be captured at the point of care and translated into useful clinical information to be applied by nurses and other health professionals.

Finally, the National Library of Medicine has sponsored research that has helped advance the literacy and impact of nursing informatics. Further targeted funding for nursing informatics and consumer informatics would be required to accelerate the national health information infrastructure in the U.S.

For further information, the developers of the PITAC report should contact the nursing leadership at AMIA (Kathleen McCormick, PhD, RN, and Connie Delaney, PhD, RN, FAAN), HIMSS (Joyce Sensmeier, MS, RN,BC, CPHIMS) or the ANA (Carol Bickford, PhD, RN,BC) who coordinated this response.

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