Globalization and advances in information and communication technologies: The impact on nursing and health

Patricia A. Abbott, PhD, RN, FAAN, FACMI
Amy Coenen, PhD, RN, FAAN

Globalization and information and communication technology (ICT) continue to change us and the world we live in. Nursing stands at an opportunity intersection where challenging global health issues, an international workforce shortage, and massive growth of ICT combine to create a very unique space for nursing leadership and nursing intervention. Learning from prior successes in the field can assist nurse leaders in planning and advancing strategies for global health using ICT. Attention to lessons learned will assist in combating the technological apartheid that is already present in many areas of the globe and will highlight opportunities for innovative applications in health. ICT has opened new channels of communication, creating the beginnings of a global information society that will facilitate access to isolated areas where health needs are extreme and where nursing can contribute significantly to the achievement of “Health for All.” The purpose of this article is to discuss the relationships between globalization, health, and ICT, and to illuminate opportunities for nursing in this flattening and increasingly interconnected world.

Thomas Friedman, in his book The World is Flat, points to an increasingly globalized world where playing fields are flattening, global connectivity has made everyone into a next-door neighbor, and economic engines are being driven from the most remote corners of the world. Friedman asserts that it is the access to information and knowledge via ICT that is contributing to this global transformation. This point is further supported, within the context of health, by Deaton, who states that “The health and life expectancy of the vast majority of mankind, whether they live in rich or poor countries, depends on ideas, techniques, and therapies developed elsewhere, so that it is the spread of knowledge that is the fundamental determinant of population health.” The assertions of Friedman combine with Deaton’s position at the intersection of ICT, globalization, and health.

The global workforce crisis, large market growth in worldwide digital communications, pressing human health catastrophes, an increasing demand for health outcomes data, and a flattening of barriers between nations are creating opportunity intersections for nursing ICT application and research. The purpose of this article is to discuss the relationships between globalization, health, and ICT, and to illuminate opportunities for nursing in this flattening and increasingly interconnected world.

In what forms can these opportunities be realized? Information and communication technology can be used to not only manage and distribute information to impact health, improve efficiency and demonstrate contributions to outcomes, but to offer a knowledge and communication lifeline to isolated providers, patients, and caregivers around the globe. Moreover, access to health care is increasingly viewed as a matter of human rights so, for those beyond the reach of adequate care, the fair distribution of health services via ICT may be a self-evident aspect of fairness. The power and reach afforded by ICT can be maximized by nurses to increase the efficiency, equity, and quality of health care, while lessening the impact of geographical distances.

These potential benefits may fail to be realized, however, if ICT, conceived with a Western mindset, flows into developing nations without concomitant attention to poverty reduction, global workforce chal-
The term globalization describes the increased mobility of goods, services, labor, technology and capital throughout the world. Most would agree that globalization has a much broader impact than just an economic impact; its impact is also political, technological, and cultural—strongly influenced by information and communication technology. Globalization, whether we recognize it or not, touches all parts of our lives—both personal and professional; it changes the way our nations and communities work.

Globalization and health have been discussed by many experts who have noted influences on wellness that are both promising and potentially devastating. Globalization in a positive sense has resulted in trade expansion, with an increase in living standards and improved social and economic status, particularly for women. Sachs, a global economist known for his work in developing nations, repeatedly makes the important point that the health of a nation is directly tied to the wealth of a nation. Wealth is enhanced by heightened competition, comparative advantage, economies of scale, and access to a greater range of products and services in globalized markets, all enabled by access to knowledge. Asymmetries of information have been reduced in an era of globalized knowledge exchange, contributing to a reduction of isolation, an increase in life spans, and improved health.

Conversely, advances in globalization are blamed for some health problems, including an increased adoption of unhealthy Western habits and lifestyle, resulting in increased obesity and the increased prevalence of chronic disease. Open borders and open access, hallmarks of globalization, have also resulted in faster transmission of infectious agents, the so-called “microbial hitchhikers.” Many societies find globalization and open information exchange threatening to current ideologies and social structure. Others view the concept of globalization, particularly via ICT, as a new age form of electronic colonialism, where existent cultures are bullied and assimilated.

How does ICT fit in this discussion of health and globalization? The World Health Organization (WHO) believes that ICT holds great promise for improving health and health care around the world and is critical to achievement of the Millennium Development Goals. The core beliefs that ICT will contribute significantly to the reduction of poverty, improve the delivery of education and health care, and make government services more accessible are prominent in the 2006 World Health Report. The 2007 report, *Towards a Safer Future*, continues to emphasize the importance of ICT in relation to health: “Today, the public health security of all countries depends on the capacity of each to act effectively and contribute to the security of all. The world is rapidly changing and nothing today moves faster than information. This makes the sharing of essential health information one of the most feasible routes to global public health security.”

A widely held view, both within the WHO and elsewhere, is that ICT in health enables rapid and global access to new therapies, techniques, and knowledge resources, with the potential to forever change the health of nations. The role of ICT in the severe acute respiratory syndrome (SARS) crisis of 2003 is a prime example. During the first cases of SARS in China in 2003, the WHO initiated a digital virtual environment consisting of 11 laboratories in 9 countries connected via ICT. Using e-mail and a secure website, these collaborators shared outcomes, post-mortem tissue analysis, electron-microscope pictures of viruses, genetic sequences and other related materials in real-time to collaboratively identify and intervene in a markedly dangerous public health risk. Other examples exist that point to the impact that ICT has had on global health efforts, such as the Academic Model for the Prevention and Treatment of HIV/AIDS Medical Record System for Africa (AMPATH–MRS), the Partners in Health Electronic Medical Record System in Haiti.

Efforts such as those mentioned above and scores of others, too extensive to enumerate, have made significant impacts in the health of large regions of the globe. However, it is important to realize that ICT can never be viewed as a panacea or singular solution to the very multifaceted problem of worldwide health. The contributors to global health are very complex, rooted in societal structures, political agendas, and the presence of marked global poverty. Solving one issue without addressing the others will result in the same outcome experienced by Sisyphus; the summit is reached, only to have the boulder roll back down to the base. In particular, efforts to improve health without addressing the pressing problem of poverty will be unsustainable.

Poverty reduction as a precursor to improvements in health is reflected in the 2007 World Health Report: “Hungry children easily acquire diseases, and easily die from the diseases they do acquire. Dwellings without sanitation provide fertile environments for transmission of intestinal infections. Hopeless life circumstances thrust young girls into prostitution with its attendant risks of violence and sexually transmitted diseases.” Productivity drops when the human capacity that fuels economic growth declines due to morbidity and mortality, and the high financial burden of disease in developing nations precludes economic advancement and health improvement efforts.
The paradox is, of course, that declining health impedes the climb out of poverty while poverty contributes to declining health. Could further enhancement of global ICT for health care be a potential strategy for escaping this paradox? What are the realities and reasoned approaches for application of ICT to impact the health of nations? What roles and opportunities for nursing leadership exist in regards to ICT regardless of geographic location?

GLOBAL ICT FOR HEALTH: REALITIES AND WORK IN PROGRESS

In many instances, the idealism of ICT potential and the reality of ICT application are discordant. Therefore, while there is acknowledged need for ICT in the coordination and monitoring of treatment, surveillance, response, education, and communication in health care, in reality there are significant barriers in the application of ICT that slow progress. These barriers are in no way restricted to the developing world. The United States and other more technologically advanced nations have their own sets of challenges. Cost, misalignment of incentives, resistance, an unskilled workforce, concerns about impact on productivity, lack of standards and interoperability, and other issues contribute to a poor level of healthcare ICT adoption in the industrialized world. The digital divide has resulted in large segments of low income and/or other underserved groups being excluded from online health resources. Economic hardships and difficult tradeoff decisions in the US healthcare industry have further inhibited healthcare information technology growth.

In developing nations, the problem of ICT uptake is even further compounded. A lack of local expertise and decades of well-meaning but non-sustainable ICT projects in the developing world have left a legacy of skepticism in their wake. Systems built for Westernized health care delivery often do not match the local context, resulting in a misalignment between need and technology. Poverty and illiteracy in developing nations stand as major barriers to the adoption and sustainability of information technologies, and many believe it is difficult to make the case for ICT when basic needs for survival are barely being met. The “e–health paradox,” a term coined by Liaw and Humphries, refers to this seeming conundrum; populations that may have the most to gain from ICT in health are those who are thwarted in their use due to barriers of untrained personnel, poor infrastructure, and lack of resources. Issues such as these have fueled technological apartheid and continue to subvert the delivery of knowledge to areas of the globe that most desperately need it.

Are the current realities in global health ICT all bad? Actually, they are not. From adversity often come new ideas. New opportunities and avenues for access and innovation in the use of ICT are emerging to improve health and facilitate the delivery of health care. The use of ICT in health care in more industrialized nations such as the United States, the United Kingdom, and Australia continues to grow, albeit at modest rates, reaching a tipping point. As discussed earlier, there are many successful implementations of ICT-enabled health communications and electronic health record systems in developing nations such as Kenya, Malawi, Peru, Rwanda, Haiti, Tanzania, and others as part of efforts like the Open Medical Record System (Open MRS). Creative thinkers are already capitalizing upon widely available forms of ICT (such as cellular telephony) to affect health.

Muhammad Yunus, whose work in microloans in Bangladesh was honored in 2006 with a Nobel Prize, is an excellent example of how the creative introduction of ICT via simple cellular telephony into a low resource area could institute profound change. Dr. Yunus and the telecom company he founded were convinced that economic and social development should begin at the grassroots level. Yunus believed that attacking poverty is essential to peace, that private enterprise is essential to reversing poverty, and that peace and poverty reduction are essential to health. Yunus’ microloans enabled destitute village women in Bangladesh to purchase cell phones and become Village Phone Operators (VPOs). The women then sold telecommunication services on a per-call basis to neighbors. This has resulted in considerable wealth generation not only for the VPOs, but for the farmers and village dwellers who are using this technology to access the outside world and improve their businesses. The VPOs provide affordable rates to their neighbors, preventing residents from making (historically, in many locales) a 6-hour roundtrip to reach a telephone, which consequently impacted community productivity and increased community wealth. The VPOs earned enough to invest in their children’s health, nutrition, and education, and fund other business growth. The improvement in community wealth translated into improved community health, as funds became available for the drilling of wells for clean water and preventive health services. The VPO model has been rolled out through much of Africa and is viewed by governments and development agencies such as the United Nations, USAID (United States Agency for International Development), and the World Bank as a sustainable development tool. Wealth has impacted health, which is a welcomed consequence.

The swell of cellular telephony has also expanded directly into the realm of health and health care in other ways, particularly as the use of short messaging service (SMS)—otherwise known as text messaging—has grown in popularity as a form of communication. For example, “Sexinfo,” a SMS-based health information service offered by the San Francisco Department of Public Health, is being used to educate and assist teens who have questions about sexual health. The Centers for Disease Control and Stanford University teamed up...
recently to hold a conference called “Texting for Health” where public health initiatives using SMS were presented.\textsuperscript{23} South Africa is using SMS features in cellular telephony to issue reminders to patients and caregivers in hopes of increasing adherence with antiretroviral therapies. Phones for Health, a Presidents Emergency Fund for Aids Relief (PEPFAR)-funded project, is also using mobile telephony to combat HIV/AIDS in Sub-Saharan Africa.\textsuperscript{24} This project allows nurses and other health workers in the field to use a standard mobile phone handset to enter health data. The system uses cellular methods to relay the data to a central database, where it is immediately available to health authorities via the internet. The system also supports the delivery of health alerts and reminder messages to caregivers.\textsuperscript{24} Each of these examples illustrates a movement using ICT to enhance information distribution that empowers financial growth, health, and social betterment, in both developed and developing nations. The success of such initiatives opens the door to innovative global ICT methods for enhancing education, public health monitoring and surveillance, and delivery and management of health. It also speaks to opportunities for those who stand at the frontline of global health efforts to consider new ways to reach and teach.

**THE OPPORTUNITY INTERSECTION FOR ICT IN NURSING**

Where is the opportunity for nurses to make a difference in regards to health care in a digital world? When one considers that 50–90\% of all health care provided “in country” is delivered by non-physician providers\textsuperscript{12} and the accessibility of ICT is accelerating, the opportunities for nurses and midwives are vast. As those who most often stand at the interface of the patient and the healthcare system, there is a growing awareness of the need for nursing leadership, nursing innovation, and the nursing voice in global health ICT.

**Nursing, ICT and Global Health**

A number of areas of development demonstrate how nursing has already embraced ICT to harness its global potential and should illustrate potential areas for growth and further investigation. Examples of success stories from a global perspective include: (1) advances in education and collaborative learning, (2) telenursing/telehealth, (3) movement toward electronic health records (EHRs), (4) nursing knowledge management and knowledge generation. In consideration of the challenges and opportunities cited earlier, these examples may stimulate critical and creative thinking about how these established examples and methods may be extended and applied by the nursing community to address the e-health paradox.

**Education and Collaborative Learning**

Information and communication technology has influenced both traditional and non-traditional approaches to education and the development of the next generation of nursing leaders. Distance education programs in nursing are exploding across the globe and are enabling outreach to geographically distributed individuals. The use of ICT to elevate the educational level of nurses worldwide is a crucial area for expansion, investigation, and application, particularly as the nursing workforce crisis grows, global health declines, and medically underserved areas increase.

Considering the issues of nurse migration and nursing brain drain,\textsuperscript{12} ICT may be an effective strategy to reduce some of the contributors to out-migration, such as isolation and lack of educational opportunity. Methods such as ICT for education to train rural providers in place can prove to be more cost effective and less disruptive to families, communities, and nations than out-migration to more developed countries.\textsuperscript{25} Moreover, collaborative learning opportunities are enabled via ICT, where geography becomes irrelevant. The opportunity for students and faculty to interact, share knowledge, discuss global health issues, and share cultural perspectives across nations affords students and faculty exposure to the world beyond them. Such experiences can increase cultural competency, raising awareness of and appreciation for global health issues.

Although the promise in using ICT to reach and teach is great, there is also a need for caution and careful consideration. As discussed earlier, the notion of Western solutions as being universally appropriate is erroneous. Understanding how information and knowledge is relevant to context and culture is essential, so as not to impose approaches or solutions that do not fit the learners’ reality. Approaches that seem appropriate for delivery in one environment may be offensive or totally unrealistic and unvalued in another, highlighting the need for local involvement, flexibility, and creativity. This is particularly apropos when considering the vast differences between industrialized and non-industrialized nations or in nations that are in conflict.

Nursing has taken the lead in several successful international collaborations involving education and collaborative learning. Two examples of the use of distributed e-learning in industrialized and non-industrialized nations are provided as a stimulus for further study and application:

**International Virtual Nursing School (IVINURS)**\textsuperscript{26} is an interesting example of a global nursing education initiative facilitated by ICT in the industrialized world. The IVINURS is working with the International Council for Nursing (ICN) on the use of the International Classification for Nursing Practice (ICNP®) to catalogue learning resources in a digital repository that can be accessed by a number of
International partners. At the present time, the IVINURS digital repository is shared by multiple global associates, including universities in Thailand, Tasmania, Ireland, Denmark, the United States, and the United Kingdom. The IVINURS does not award degrees and is built on the principles of international collaboration and the global sharing of knowledge and professional expertise. A central activity of IVINURS is the building of its digital repository and the development of associated e-learning support products, with the aim of providing quality, learning resources that can be shared on a global level by its partners, and used to enhance both e-learning and traditional instruction in their respective settings. This not-for-profit entity, registered in the United Kingdom as a Limited Company with charitable status, is still in formative stages, and expects to make available studies of its impact in the near future.

African Medical and Research Foundation (AMREF) in Uganda is an example of using ICT in the developing world for nursing education and scale-up. This public-private partnership plans to increase the basic education level of 22,000 Kenyan nurses up to the level of “registered” (diploma) from the current level of “enrolled” (certificate) within 5 years. At present, 70% of the nursing workforce in Kenya is comprised of “enrolled” nurses, whose level of education leaves them ill-prepared to handle the complex health needs of the Kenyan population. The AMREF’s “Virtual Nursing College” currently has 4,000 nurses enrolled at 100 computer-equipped training centers in 8 provinces, including several refugee camps. The curriculum is delivered via ICT and, in October of 2007, the first class of ICT-trained Kenyan nurses completed the program.

While too early to discuss program outcomes, the fact that 70% of all nurses enrolled in this program are from rural areas speaks to a great potential for communities outside of urban centers. This model is planned to be extended to other African nations who are experiencing similar nursing crises. The AMREF program is also important because of an important but less publicized goal—that all 22,000 nurses will be computer literate. This very unique and vital component leaves Kenya ready to lead in the movement towards e-health in the developing world. This could accelerate the achievement of the WHO Resolution WHA58.28, an e-health strategy adopted by the Fifty-eighth World Health Assembly in May 2005 that articulates the preparation of an ICT-competent global health workforce.

These 2 brief examples, while using different methods and addressing 2 different audiences of nurses, demonstrate the potential of ICT within the nursing education realm. It also demonstrates the reach of IT-enabled methods in rapidly digitizing developing nations—further illustrating an area of opportunity for expansion. Considering the global workforce crises in nursing, these models are worth further consideration.

Telenursing/Telehealth

Telenursing is the use of technology to deliver nursing care and conduct nursing practice. Telenursing is often used interchangeably with the term telemedicine or telehealth with the distinction implied that a nurse provides telenursing and a physician provides telemedicine. The use of the term telehealth may be more appropriate, as the success of this modality requires multiple partners, including the professionals delivering services, technical support personnel, and the client or patients themselves whose participation is essential to successful outcomes. Telehealth, in all of its definitions and permutations, has made large strides in expanding healthcare services to underserved areas around the globe.

In a recent study, 719 nurses representing 36 countries responded to a survey querying their telenursing competencies and skills. Patients with chronic illnesses were those most often cared for using telenursing services. Although most telenurses worked in hospitals, the settings varied widely, including traditional work places such as clinics to community-based settings such as schools and prisons. Several countries have well-developed telenurse programs, including Canada and New Zealand. The trend towards expansion of this nursing specialty is expected to continue, particularly as ICT continues to reach all areas of the globe and as the medically underserved areas of the world are illuminated.

Telehealth/telenursing in the traditional sense may conjure up visions of expensive computer workstations, call-centers, or a nurse in a chat room. While these visions are perfectly realistic in the developed world, they are quite unrealistic in many parts of the globe. However, with the growth of cellular telephony, particularly in Africa, tremendous opportunities exist for nurses to creatively apply telehealth modalities to long-standing patient care issues. For example, Elder and Clarke cite the following examples for the potential use of cellular telephones and Personal Digital Assistants (PDAs) for telehealth in Africa and Asia.

- Automation of demographic surveillance activities such as those at the core of pioneering health care initiatives (e.g., the Tanzanian Essential Health Interventions Project)
- Testing of the use of SMS (short message service) reminders in the treatment of tuberculosis in Cape Town, South Africa
- Delivery of continuing medical education and professional development via PDA
• Delivery of time-sensitive alerts to patients and healthcare workers
• Maintenance of patient records for HIV-positive patients’ lifelong drug treatments
• Management of specific health care initiatives such as the roll-out of antiretroviral therapy and tuberculosis treatment initiatives

Again, realizing the numbers of nurses who are in the frontline of primary care around the globe and in light of the massive growth of ICT for health, tremendous opportunity awaits those who are primed to capitalize upon these factors. Making the application of telehealth/telenursing successful in developing countries will require strong nursing partnerships and leadership, however. Nurses are in a position to drive the development of science in this area, since many aspects of nursing care are naturally amenable to virtual delivery, especially in areas of assessment, patient teaching, decision support, and early identification of problems.\(^3^4\)

Interoperable Electronic Health Record Systems

Globalization is driving the need to communicate and share healthcare data and information across national borders. Many countries are focusing on interoperable Electronic Health Record Systems (EHRS) as a solution for sharing data and information among various sources (e.g., clinical information systems, personal health records, public health surveillance systems, and knowledge repositories). For EHRS to reach full potential, however, interoperability and connectivity to distributed data repositories is fundamental, particularly in light of distributed healthcare services, geographical challenges, and migrating populations.

In a global sense however, there are vastly different levels of EHRS readiness and capacity for EHRS interoperability. In many places, EHRS are unknown yet the need for health data (in any fashion) is great. Even the most remote of locales often have reporting requirements, either from Ministries of Health or donor agencies. Accountability for receipt and utilization of goods and services, demonstration of outcome achievement, and measurement of milestones are resulting in increasing pressures on nurses, other providers, and administrators for improved information management and tracking. Quick fixes or one-off solutions, characteristic of many health data tracking efforts, often result in unusable, non-interoperable, and unsustainable systems that are soon abandoned, threatening clinic viability and leaving service providers frustrated.

Efforts such as Open MRS are gaining in popularity, due to its open source (free) and interoperable nature, and its well-established success in many clinical settings across the global south. Open MRS is an example of an EHRS system, built to agreed-upon standards that enable interoperability, data exchange, and the ability to use it in many different settings in many different locales. While this is an open source and freely available system, there are no documented examples of nursing use—which is puzzling when one considers the number of nurses who are responsible for clinic operations around the globe. It is important to note that, even in developed nations, nursing involvement in EHRS specification and development is disappointingly low. Such lack of EHRS involvement by nursing in both developed and developing nations makes it that much easier for nursing data to remain invisible and consequential to determination of health outcomes.

EHRS Standards

Healthcare, both nationally and internationally, is a product of teams (including the patients), and such teams are reliant upon the sharing of information and knowledge. Standards facilitate sharing of data, information and knowledge and are a foundational underpinning for system interoperability. Those who do not participate in standards development, implementation, and use face the prospect of exclusion in EHRS. As is, the contributions that nurses make to patient outcomes and the achievement of larger health care goals are frequently invisible in EHRS because the standards that exist to represent nursing practice in automated systems are either underused or excluded. Nurse-sensitive measures are frequently omitted from EHRS for a multitude of reasons, and they will continue to be, unless the case is made for inclusion. As nurses accelerate their utilization of and leadership in ICT-based efforts such as the EHRS, the chance to share perspectives, experiences, and best practices via standardized and exchangeable data must not be missed. Nursing experience, leadership, and the nursing voice are needed.

Interoperability from a global perspective requires international standards in many dimensions such as messaging, security, language, ethical information use, ICT management, and other areas—all of which impact nursing and EHRS. Again, nursing involvement is critical. One challenge is that there are multiple standards-setting agencies and, most likely, always will be due to the complexity of stakeholders, which increases the difficulty of nursing participation, particularly in consideration of the dearth of qualified standards-literate nurses. While there are many standards organizations around the globe, the International Standards Organization (ISO) and Health Level 7 (HL7) are 2 of the major standards-setting organizations where nursing is represented (albeit in small numbers), and it must continue to be so.

An example of successful nursing involvement and leadership in global standards work is the ICNP®. Initiated in 1989 by the International Council of Nurses (ICN), ICNP® is defined as a unified nursing language that enables nurses to participate in standards development, implementation, and use in their work. The vision of ICNP® is to be an integral part of the global information infrastructure informing
health care practice and policy to improve patient care worldwide. Through standardizing the clinical terminology nurses use to describe their practice, ICNP® can improve nursing practice and contribute to the advancement of nursing science. The ICN also recently partnered with the International Medical Informatics Association—Nursing Informatics and the international nursing informatics community to establish an international standard through ISO. This standard, Integration of a Reference Terminology Model for Nursing, provides a framework which can be used to map concepts across different terminologies, thereby increasing communication and comparability of data across languages and countries. This ISO standard is currently under routine review and is expected to contribute to ongoing harmonization across multiple international standards, giving structure to nursing data in global EHRS efforts. This work is critical to understanding the full processes of and contributors to health care. Analysis of data that does not include nurse-sensitive measures, nursing interventions, and nursing contributions to outcomes is deficient, incomplete, and prone to spuriousness.

The International Telecommunication Union (ITU) is another organization involved in standards development that has direct bearing on nursing practice, particularly as related to communications protocols used in disaster relief and community-based services in the aftermath. As the leading United Nations agency for information and communication technologies, ITU plays a prominent role in the development and deployment of global ICT standards. For example, in the aftermath of the Indian Ocean tsunami in 2004, ITU played a major role in pushing for standards for public warnings (called CAP or Common Alerting Protocol), disaster management, prevention, and relief. There is a great need for the nursing perspective in these concerns, particularly since a great deal of the care in disaster relief efforts is provided by teams heavily infused with nursing personnel. Nurses, as first responders and those often managing the ongoing health needs of a community after disaster teams have left, have a vested interest in ICT that supports information and workflow needs. Unfortunately, nursing is often absent from the development and deployment of such standards and are frequently left to deal with suboptimal systems.

Nursing leadership is critical to break the chicken and the egg cycle that comes from unstructured, nonstandardized, and invisible nursing data in the rapidly digitizing world. Without comprehensive, rigorous and accessible digital nursing data from large healthcare datasets, nursing practice remains largely invisible, and invisible nursing contributions lead to false assumptions of low nursing contribution to health and health outcomes. In reality, much has not changed since Florence Nightingale wrote in her 1863 book Notes on a Hospital, “In attempting to arrive at the truth, I have applied everywhere for information, but in scarcely an instance have I been able to obtain hospital records fit for any purposes of comparison. If they could be obtained . . . they would show subscribers how their money was being spent, what amount of good was really being done with it, or whether the money was not doing mischief rather than good . . . .” In 2008, 143 years later, we are still struggling to determine the amount of good that is being provided, largely because the nursing data that is foundational to a full understanding of nursing contributions to outcomes, both good and bad, is still unfit and unavailable for comparison. The opportunities and critical need for nursing leadership are growing exponentially.

Knowledge Management and Knowledge Generation in Nursing

Information itself is becoming a major commodity in health; there are multiple stakeholders interested in access to and sharing of data and information. Access to reservoirs of experiential knowledge and collections of explicit information allows for the development of new knowledge based on identified needs, to refine knowledge that already exists, to avoid duplication of effort, to increase alignment with local circumstances, and enhance the creation of actionable knowledge. The value to nursing of such collections of knowledge and experience becomes quite obvious, particularly when considered in the global context and in the face of asymmetries of information. Effken and Abbott have identified ICT solutions for knowledge management in nursing, including the creation and participation in communities of practice (CoPs).

CoPs trace their roots back to constructivism where the control of learning shifts from the instructor to the learner. Wenger discusses ICT supported CoPs specifically, stating “Every group that shares interest on a website is called a community today, but communities of practice are a specific kind of community. They are focused on a domain of knowledge and over time accumulate expertise in this domain. They develop their shared practice by interacting around problems, solutions, and insights, and building a common store of knowledge.” From a global nursing perspective, especially in light of the scarcity of nursing resources, reusable and accessible nursing knowledge empowered by ICT is a powerful tool for the profession.

One such ICT-supported CoP is the Global Alliance for Nursing & Midwifery, a project initiated out of the WHO Department of Human Resources for Health, the WHO Office for Nursing & Midwifery, and the Johns Hopkins University School of Nursing Collaborating Center for Nursing Knowledge & Information Management. This platform designed for nurses and midwives serves as an open knowledge exchange CoP with a current membership of 1,500 from approximately 123
different countries. The Alliance has served as a learning platform, a library, and a knowledge exchange forum for global nurses to exchange best practices, participate in open continuing education, and manage knowledge. The Global Alliance is unique in that it runs over very low-bandwidth, standard telephone service to allow participation by those in areas without full Internet connectivity. Participation from low-resource areas is surprisingly robust.

Other CoPs exist for nursing, and growth in this area is expected. For example, Hara and Hew in studying an online CoP for critical care nurses in the Pacific Rim found that an e-CoP helped not only to reinforce the identity of the practice of critical care nursing among participants, but that it also served as an important avenue for information and knowledge exchange within the context of everyday work. These authors believe that: “Communities of practice can be described as groups of people who are informally bound together by shared expertise and a passion for joint enterprise. They can be viewed as informal networks that support professional practitioners to develop a shared meaning and engage in knowledge building among members. The theoretical construct of communities of practice is grounded in an anthropological perspective that studies how adults learn through everyday social practices rather than focusing on environments that are intentionally designed to support learning.”

Information and communication technology has also stimulated the growth of other approaches to knowledge generation and nursing research. For example, ICN recently initiated an electronic International Nursing Partnership Database Project. The goal of this project is to document and share ongoing and new international partnerships, as a tool to encourage similar initiatives and aid in planning new ventures. Rather than relying on the traditional literature sources for networking and proposal development, this database can provide researchers and others with pre-publication information about existing projects in process. Similar to the CoP concept, the ICN shared database allows the sharing of partnership experiences and results to maximize efficiency and effectiveness. The ICN has also developed a portal called the International Nursing Network to facilitate the exchange of ideas, experience, and expertise for the nursing profession crossing a variety of areas from advanced practice nursing to disaster preparedness. This open access portal serves as a mechanism to encourage global nursing interaction.

The management and generation of new nursing and healthcare knowledge is deepened and advanced as new evidence, new perspectives, and new discoveries are shared among global nurses and midwives. Information and communication technology provides an opportunity to facilitate participation and to establish partnerships using technology that connects those otherwise not connected. Enabling these connections will promote approaches not yet realized to managing, sharing, and generating nursing knowledge. The ultimate benefactors include not only the patients and communities that we serve, but the profession of nursing itself.

**FUTURE OPPORTUNITIES**

Some scholars suggest that there is a leadership void in nursing, particularly in the global south, where the needs are the greatest. Leadership for strategic use of ICT and informatics in nursing, and strategic partnerships to support mutual enhancement of ICT is an important strategy for the promotion of global health. Entrepreneurial opportunities exist for those proactive and creative thinkers who stand ready to capitalize upon them.

Nurses cannot wait for ICT to bring answers to the problems faced in today’s world; rather, they need to be engaged in problem-solving activities, testing and evaluating solutions to global health issues using ICT. The pace at which ICT seeps into health care is only expected to increase, and reasoned action by the nursing community is imperative. The nursing informatics arena has provided avenues for nurses to serve as leaders, including multiple roles in nursing and through participation in professional organizations. However, nursing informatics, like nursing in general, stands at the edge of a workforce crisis that threatens nursing participation in the rapidly progressing world of ICT. Nursing as a profession cannot leave the progress needed in the face of accelerated global ICT solely in the hands of nurse informaticians. Informatics practice is quickly becoming part of the expected competency of every nurse and, therefore, is becoming not only a responsibility of every nurse, but as an opportunity for every nurse. The absence of the nursing voice and nursing leadership as global e-health explodes is foreboding.

In addition to leadership, strong partnerships are essential to advancing health globally. These partnerships should not only include corporate and philanthropic organizations, but partnerships within the healthcare team as well. Interdisciplinary work is critically important and the major contributions that nurses make to global health must be acknowledged and supported at levels much higher than they currently are. Similar to the efforts undertaken by the Robert Wood Johnson Foundation’s *Commitment to Nursing*, it would seem appropriate that major foundations and funding agencies would support the investigation and growth of ICT as a strategy to support frontline nursing care, since nurses are such a vital source for the delivery of health services worldwide. It is also important to emphasize that the agenda for using ICT to advance global health is in no way limited to experts in informatics. Nursing expertise in practice, education, administration, research, and policy are all required to advance this agenda. The nursing profession, as partners
in improving global health care, has much to contribute, particularly in this new interconnected and flattened world.

Entrepreneurial opportunities for nurses who are interested in global health and who understand and are intrigued by digital innovation abound. The authors have highlighted examples of first steps that the nursing community has already taken in applying ICT to health and healthcare. Following the example of AMREF in Uganda and the online training of 22,000 nurses—could this model not be built upon and expanded to the global nursing workforce? Could nurses, long known for their crucial role in patient education, develop ICT-supported solutions to reach patients, their families and caregivers—regardless of geographic location? Can we use ICT to provide lifelines to isolated nurses, midwives and others who are serving their communities? Can we deploy simple ICT solutions to combat the problems of collecting critical individual and population health data in remote locations? Considering that there are more mobile telephones in use in China today than there are people in the United States,1 what innovative mobile methods could be developed to deliver health messages, answer questions, or collect data? What role might social networking (e.g., wikis, blogs, virtual communities) play in nursing of the future? What shall be the legacy of the current generation of nursing leaders in this rapidly digitizing world? To answer these questions, we need nurses who have what Henry Ford classified as those with an “infinite capacity to not know what can’t be done.”

CONCLUSION

Nursing has a long-standing history of advocacy, innovation, and education. The growth of ICT in the health and healthcare sector should be looked at as an opportunity for nursing to use a new medium to meet the mission of our profession, not as something to be approached with trepidation and fear. As globalization expands, nursing has the opportunity to step forward and harness the power of ICT to serve the greater good. While it is often difficult to make the case for ICT in areas where running water and electricity are considered a luxury, access to information must be viewed as a basic tenet of a developing nation, with efforts to increase ICT and decrease poverty as complementary, not competitive activities.18 As nurses, we have the opportunity to renovate and innovate, as we shepherd developments in a way that promotes health for all.

REFERENCES

Available in the online version of this article at the Nursing Outlook Website: www.nursingoutlook.org.
REFERENCES

1. Friedman T. The World is Flat: A Brief History of the Twenty-First Century. New York, NY: Farrar, Straus and Giroux; 2005.
2. Deaton T. Health in an Age of Globalization. Available at: https://muse.jhu.edu/journals/brookings_trade_forum/v2004/2004.1deaton.pdf. Accessed June 2, 2008.
3. Government of Canada (2007) Globalization definition. Available at: http://www.canadianeconomy.gc.ca/english/economy/globalization.html. Accessed on November 20, 2007.
4. Shaw S. (2004). Nursing Leadership: International Council of Nursing. Blackwell Publishing, Hoboken, New Jersey.
5. Bettcher D, Lee K. Globalisation and public health. J Epidemiol Community Health 2002;56:8-17.
6. Bezruchka S. Is globalization dangerous to our health? West J Med 2000;172:332-4.
7. Yach D, Fluss SS, Bettcher D. Globalization and health: Targets met, new needs. Politica Internazionale 2001;12:233-53.
8. Yach D, Bettcher D. The globalization of public health. I. Threats and opportunities. American Journal of Public Health 1998;88:735-8.
9. Sachs J. The End of Poverty: Economic Possibilities for Our Time. New York, NY: Penguin Press; 2005.
10. Stiglitz R. Globalization and Its Discontents. New York, NY: W.W. Norton & Co; 2003.
11. Zemblyas M, Vrasidas R. Globalization, information and communication technologies, and the prospect of a ‘global village’: Promises of inclusion or electronic colonization? J Curriculum Studies 2005;37:65-83.
12. World Health Report. The World Health Report 2006: Working Together for Health. World Health Organization, Geneva. Available at: http://www.who.int/whr/2006/en/. Accessed on May 30, 2008.
13. World Health Report. Towards a Safer Future. World Health Organization, Geneva. Available at: http://www.who.int/whr/2007/en/. Accessed on May 30, 2008.
14. Fraser H, Biondich P, Moodley D, Choi S, Mamlin B, Szolovits P. Implementing Electronic Medical Record Systems in Developing Countries. Inform Prim Care 2005;13:83-95.
15. Beck D. (2004). Health, Wealth, and the Chinese Oedipus. Society, Jan, 2004.
16. Wagner TH, Bundorf MK, Singer SJ, Baker LC. Free internet access, the digital divide and health information. Med Care 2005;43:415-20.
17. Davis K, Schoen C, Guterman S, Shih T, Schoenbaum S, Weinbaum L. (2007). Slowing the Growth of U.S. Health Care Expenditures: What Are the Options? The Commonwealth Fund Report, Volume 47, January 29, 2007.
18. Abbott P. E-health and Medical IT: A Report. Touch Briefings. Available at: http://www.toucbriefings.com/cdps/editem.cfm?mid=1965&cid=5. Accessed on December 28, 2007.
19. Liaw S, Humphreys J. Rural eHealth paradox: It’s not just geography! Aust J Rural Health 2006;14:95-8.
20. Grameen Foundation. Available at: http://www.grameenfoundation.org/what_we_do/technology_programs/village_phone/. Accessed on December 22, 2007.
21. Giridharadas A, Bradsher K. (2006). Microloan Pioneer and His Bank Win Nobel Peace Prize. New York Times. October 13, 2006. Available at: http://www.nytimes.com/2006/10/13/business/14nobelcnd.html. Accessed on July 1, 2008.
22. “Sexinfo.” Available at: http://abclocal.go.com/kgo/story?section=news/local&kid=4112467. Accessed on February 18, 2008.
23. “Texting For Health.” Available at: http://www.texting4health.org/page2/page2.html. Accessed on April 12, 2008.
24. “Phones for Health.” Available at: http://www.gsmworld.com/news/press_2007/press07_20.shtml. Accessed on April 2, 2008.
25. King L. Distance education: The solution for nursing and midwifery in Africa? Int Nurs Rev 2000;47:63.
26. Rogerson E. Global collaboration: Using ICNP in a digital repository. ICNP Bulletin December 2008, No. 2. Geneva: International Council of Nurses; 2006.
27. African Medical and Research Foundation (AMREF). Available at: http://www.amref.org/index.asp?PageID=514&SearchStr=e%2Dleaming. Accessed on January 10, 2007.
28. Kenya Graduates First 98 Nurse. Available at: http://careers3.accenture.com/ATS/Global/News/0801_Kenya_Nurses_elearning.htm. Accessed on May 15, 2008.
29. Schlachte L, Sparks S. Definitions of Telenursing, Telepresence. In: Encyclopedia of Nursing Research. Fitzpatrick J, editor. New York, NY: Springer Publishing, Inc; 1999.
30. Grady J, Schlacht L. Report of the 2004-2005 International Telenursing Survey. Comput Inform Nurs 2007;25:266-72.
31. National Initiative for Telehealth (NIFTE) (2003). National initiative for telehealth framework of guidelines. NIFTE website, National Initiative for Telehealth Guidelines—Available at http://www.nifte.ca. Accessed on July 1, 2008.
32. Nursing Council of New Zealand (2000). Professional standards for TeleNursing Practice. Available at: http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/13/89.pdf&siteID=d1e%2Dlearning. Accessed on July 1, 2008.
33. Elder L, Clarke M. Past, present and future: Experiences and lessons from telehealth projects. Open Med 2007;1:e166-70.
34. Schlachte-Fairchild (2007). International competencies for telenursing. Published by: International Council of Nurses, Geneva. Available at: http://www.icn.ch/store/wwbook/newpubs.html. Accessed on July 1, 2008.
35. International Council of Nurses (ICN) (2005). International Classification of Nursing Practice Version 1.0, Geneva: Published by: International Council of Nurses, Geneva.
36. ISO: Integration of a reference terminology model for telenursing. Published by: International Council of Nurses, Geneva. Available at: http://www.iso.org/iso/catalogue/catalogue_tc/catalogue_detail.htm?csnumber=33309. Accessed on April 15, 2008.
37. Saba VK, Hovenga E, Coenen A, McCormick K. (2003). Integrating a reference terminology model into a telehealth care repository. ICNP Bulletin December 2008, No. 2. Geneva: International Council of Nurses; 2006.
38. International Telecommunications Union. Available at: http://www.itu.int/net/home/index.aspx. Accessed on January 7, 2008.
39. “Phones for Health.” Available at: http://www.gsmworld.com/news/press_2007/press07_20.shtml. Accessed on April 2, 2008.
40. King L. Distance education: The solution for nursing and midwifery in Africa? Int Nurs Rev 2000;47:63.
41. Rogerson E. Global collaboration: Using ICNP in a digital repository. ICNP Bulletin December 2008, No. 2. Geneva: International Council of Nurses; 2006.
42. African Medical and Research Foundation (AMREF). Available at: http://www.amref.org/index.asp?PageID=514&SearchStr=e%2Dleaming. Accessed on January 10, 2007.
43. Kenya Graduates First 98 Nurse. Available at: http://careers3.accenture.com/ATS/Global/News/0801_Kenya_Nurses_elearning.htm. Accessed on May 15, 2008.
44. Schlachte L, Sparks S. Definitions of Telenursing, Telepresence. In: Encyclopedia of Nursing Research. Fitzpatrick J, editor. New York, NY: Springer Publishing, Inc; 1999.
45. Grady J, Schlacht L. Report of the 2004-2005 International Telenursing Survey. Comput Inform Nurs 2007;25:266-72.
46. National Initiative for Telehealth (NIFTE) (2003). National initiative for telehealth framework of guidelines. NIFTE website, National Initiative for Telehealth Guidelines—Available at http://www.nifte.ca. Accessed on July 1, 2008.
47. Nursing Council of New Zealand (2000). Professional standards for TeleNursing Practice. Available at: http://www.health.nt.gov.au/library/scripts/objectifyMedia.aspx?file=pdf/13/89.pdf&siteID=d1e%2Dlearning. Accessed on July 1, 2008.
48. Elder L, Clarke M. Past, present and future: Experiences and lessons from telehealth projects. Open Med 2007;1:e166-70.
49. Schlachte-Fairchild (2007). International competencies for telenursing. Published by: International Council of Nurses, Geneva. Available at: http://www.icn.ch/store/wwbook/newpubs.html. Accessed on July 1, 2008.
50. International Council of Nurses (ICN) (2005). International Classification of Nursing Practice Version 1.0, Geneva: Published by: International Council of Nurses, Geneva.
51. ISO: Integration of a reference terminology model for nursing. Available at: http://www.iso.org/iso/catalogue/catalogue_tc/catalogue_detail.htm?csnumber=33309. Accessed on April 15, 2008.
52. Saba VK, Hovenga E, Coenen A, McCormick K. (2003). Nursing language–terminology models for nurses. ISO Bulletin. Page 16-18.
53. International Telecommunications Union. Available at: http://www.itu.int/net/home/index.aspx. Accessed on January 7, 2008.
54. “Phones for Health.” Available at: http://www.gsmworld.com/news/press_2007/press07_20.shtml. Accessed on April 2, 2008.
55. King L. Distance education: The solution for nursing and midwifery in Africa? Int Nurs Rev 2000;47:63.
40. Effken J, Abbott P. (in press). The Nursing Role in Health IT-enabled Care Management in Rural, Frontier, and other Underserved Populations. Commissioned White Paper; Agency for Health Care Quality and Research. Prime Contract No. 290-04-0016-6275-AMIA-01.

41. Wenger E. A Study of Technologies for Communities of Practice. Available at: http://www.ewenger.com/tech/executive_summary.htm. Accessed on January 5, 2008.

42. Global Alliance for Nursing and Midwifery (2006). Available at: my.ibpinitiative.org/public/gamm/. Accessed on January 10, 2007.

43. Hara N, Hew KH. A Case Study of a Longstanding Online Community of Practice Involving Critical Care and Advanced Practice Nurses. Proceedings of the 39th Hawaii International Conference on System Sciences. Available at: http://ieeexplore.ieee.org/iel5/10548/33367/01579587.pdf. Accessed on June 2, 2008.

44. International Council of Nurses (ICN) (2008). Available at: http://www.icn.ch/partnerdata.htm. Accessed on January 22, 2008.

45. ICN Nursing Networks. Available at: http://www.icn.ch/networks.htm. Accessed on May 19, 2008.

46. Klopper H. Poverty and development: Pulling forces and the challenges for nursing in Africa. Nurs Health Sci 2007;9:295-303.

47. Newburg C. The Robert Wood Johnson’s Commitment to Nursing. In: Isaac S, Nickman J, editors. The Robert Wood Johnson Foundation Anthology: To Improve Health and Health Care Volume VIII. Available at: http://www.rwjf.org/files/publications/books/2005/chapter_04.pdf. Accessed on June 2, 2008.