Information Technology in Nursing

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ABSTRACT

Modern medicine has developed dynamically and rapidly. Its rapid improvement puts this branch of science in the most advanced positions of world science and new innovative trends. Undoubtedly, this is directly related to the social aspect of medicine. Every day and every hour, innovations in medicine are increasingly affecting the quality of life of the population of planet Earth. Today, modern innovative technologies restore the health to a large number of patients every day.

Keywords: *Nursing, Medicine, Health, Technology*

INTRODUCTION

We are in the midst of an information revolution in modern society that is transforming the ways that we communicate and organize information [1]. Nowhere is the adoption of new information technologies more evident than in the delivery of care and the promotion of health. There has been a rapid growth in the development and use of new health information technologies, such as electronic medical records, online support groups, and the omnipresent availability of health information via specialized web sites. E-health encompasses a range of overlapping disciplines that relate to the application of information, computer and communication technology to the delivery of health care and the promotion of health.

E-health communication strategies include, but are not limited to, health information on the Internet, computer assisted learning, online support groups, online collaborative communities, information tailored by computer technologies, computer-controlled in-home telephone counseling, biometric assessment and transmission, and patient–provider e-mail contact. Each of these e-health technologies has the potential for helping to promote pain management to the extent that they can provide consumers with relevant information to increase understanding of their pain experience, help consumers explore different strategies for reducing their experience of pain, coordinate the delivery of effective and timely palliative care, and provide consumers with needed social support.

The use of technology in health care has increased dramatically over the past several years [2]. Nurses now use electronic charting to document the care they are providing to their patients. The information they record can be accessed by the rest of the health-care team to make decisions regarding care. Having the ability to access patient information at any point of care improves communication among providers and allows for care to be provided in a more timely manner. Telehealth is a sophisticated way to use technology to improve diagnosis and treatment of health conditions. It allows individuals to receive medical and nursing services from distant geographic regions. Telehealth providers can remotely interview a patient, review an x-ray or laboratory tests, or suggest treatments and procedures. This technology includes devices to remind patients to take medications, provides Web-based video office calls, and provides equipment that can monitor a person's vital signs at home and send electronic results to the doctor's office.

TELEHEALTH

Telehealth is the provision of health services at a distance using a range of digital technologies and mobile technologies [3]. This can be to promote self-care, for example, to enable a patient to monitor their own vital signs such as blood pressure, or from a monitoring perspective, physiological data could be transferred to a remote monitoring centre to allow for health professionals to intervene if measurements fall outside of expected parameters. The RCN (Royal College of

Nursing) suggests telehealth is not a new technology or branch of health care, but should be integrated within existing healthcare infrastructures. The services could involve consultation, patient monitoring, diagnosis, prescriptions or treatment and can be done in real time or delayed through media such as teleconferencing, videoconferencing or the Internet. It should be a targeted approach to enhance service delivery focused around the service user, enabling a more efficient and effective use of clinical resources.

The ability for someone to monitor a critically ill patient from another site has created the opportunity to develop what is being called the electronic ICU (eICU) [4]. The eICU includes both monitoring equipment and video cameras connected to a separate monitoring center. In the monitoring center, an expert ICU nurse assumes the role of overseeing the electronic monitoring of patients, analyzing data, and recognizing patterns. The eICU nurse uses the video monitor to view a patient as well as review monitor information. The bedside nurse manages the direct care of two or three patients. The eICU nurse communicates with the bedside nurse to alert that individual to problems that occur and may initiate calling a physician if necessary. Working together, the bedside nurse and the eICU nurse form a strong team to ensure that the patient receives optimum care.

The nurse's role in the care of the patient has evolved, and with that has come a change in the way nurses think about and use technology to improve healthcare delivery [5]. Every nurse today needs to be proficient in collecting and reviewing data and information related to their patients. The clinical practice requirements for nursing promote the development of skill sets important for informatics practice. The nursing process of assessment, problem identification, and care planning, combined with how nurses set priorities and always evaluate, prepare nurses to be early adopters and to employ and adapt the "systems life cycle" approach for delivering informatics projects.

Project management—a vital skill in managing IT projects by establishing timelines, milestones, task dependencies, and resources—is more easily grasped by clinicians who have worked in areas of care requiring constant priority setting and evaluation, such as emergency or critical care.

A nurse professionally trained in informatics is part of a greater discipline of healthcare informatics. These nurses know how to apply IT to enhance their clinical skills and work with nurses across the healthcare continuum to integrate nursing science, computer technology, and information science resulting in improved communication, documentation, and efficiency. Possessing knowledge in these three areas positions nurse informaticists to lead the development of an emerging concept in healthcare—"clinical intelligence" (CI).

Telenursing is also a nursing specialty and is slowly making its way into community nursing courses [2]. The newest trends in telehealth focus on the patient in order to provide patient care in patients' homes instead of the provider's setting. A simple example of a licensed practical nurse (LPN) using telenursing occurs when an order is requested and received via text or e-mail. Another example of telenursing is an LPN in a physician's office who coaches a patient with a chronic condition over the phone. A more in-depth example of telenursing is an LPN who is physically in a remote location with a patient and is able to attach monitoring equipment to the patient for a physician in another location to monitor that patient's disease or condition. These types of telenursing allow for more frequent contact, frequent monitoring of compliance, and identifying potential problems before they occur. It also tends to eliminate unnecessary visits, emergency room visits, and some hospitalizations. It is cost effective and is starting to be recognized for reimbursement by insurance companies and Medicare. The biggest stumbling blocks to this technology currently are reimbursement, research, legal, and technical issues. Can you imagine the impact this kind of care is currently having in allowing for follow-up appointments for veterans and in providing health care in disaster areas? Imagine the impact it could have on overall health promotion and on our nation's current mental health care crisis. The use of telehealth has the potential to revolutionize many areas of health care by reaching more patients in a timely and effective manner.

Telenursing is a relatively young field; consequently, further long-term studies with regard to legal issues, cost, and safety are required before the technology can be integrated into the mainstream health-care system [6]. Telenursing services are not going away, but the field is evolving. As with many young disciplines, telenursing seems to redefine itself on a fairly regular basis – changing to meet the demand of managing more and larger

specialties. Telenursing is growing worldwide annually, due, in large part, to the approval of procedures. In addition, given better acceptance among nurses, physicians, hospitals, and patients, this growth will likely increase. It must be noted that the growth of telenursing will directly support and help the growth of nursing, because telenursing is, of course, an integral part of nursing.

EHR

Electronic communication and electronic connectivity is an essential component to any electronic system, including EHRs (Electronic Health Records)[7]. The electronic connectivity is the ability for a health care organization to support the use of an EHR through the use of Internet access and in some cases phone lines (e.g., if using mobile devices). The connectivity also includes the information technology (IT) infrastructure to support the users of the EHR and other electronic information systems. The infrastructure includes hardware and software technologies, physical space for the hardware, financial resources, and information technology professionals with the expertise to support the electronic connectivity infrastructure within a health care organization. The size of the health care organization will have an impact on the size of the IT infrastructure. Electronic communication could be represented as electronic mail or messaging through the EHR. Other options include the electronic transmission of patient information between information systems. The electronic transmission of patient information between and across information systems requires the use of interfaces and EHR interoperability. Depending upon the health care organization, the technical infrastructure for Internet access may already be established or many not exist at all. The evaluation of the technical infrastructure to support an EHR is an essential first step to determine what additional requirements will need to be installed and tested in addition to the EHR itself.

The definition of an EHR implies the dependence on electronic connectivity. Thus electronic connectivity within the health care organization is a prerequisite for a successful implementation and adoption of an EHR. Based on the needs of nurses, providers, and other health care professionals, health care organizations should be ensuring that there is Internet access that is supported from wired and wireless connections. If wireless connections are not possible, the health care organization

Components of Electronic Health Records must evaluate their care settings to ensure that the placement of hardware devices for accessing the EHR is supportive of the nurses, providers, and all other health care professionals' workflows.

MODERN MEDICINE

The power of modern medicine thus rests on its causal efficaciousness without the need for a concordance of belief between healer and patient [8]. As a result, in the modern concept of the therapeutic, truth is displaced as a value and the patient's autonomous agency is marginalized. The patient does not need to believe, understand, or know, because modern medicine operates outside the sphere of communal or personal validation, relying instead on scientific knowledge to treat disease. The modern concept of the therapeutic thus has little need for widespread social understanding or support, relying instead on a narrower and specialized scientific standard of truth. Specialized scientific knowledge rather than a communal system of belief is pivotal. Of course, one might object that this scientific standard of truth is itself socially accepted. That is certainly true, but the acceptance is predicated on a global and mostly blind faith in scientific progress and technology rather than on an understanding of even key scientific concepts and acceptance of scientific beliefs. The acceptance of science is thus predicated less on the meaningful way that it explains common social experience than on its power as technology. There exists a striking gap between scientific and everyday modes of explanation that permeates the modern view of therapy as well.

Since the therapeutic has become appropriated as a concept of specialized professional knowledge, the sick person is conceived to lack the personal resources to help herself. On this view, then, autonomy is by definition waived or compromised by illness. The sick individual becomes fully a patient and so ceases to be an agent. In this regard it is enlightening to note that informed consent is a uniquely modern development. Informed consent requires disclosure of information regarding the treatment proposed, its risks and benefits, as well as the alternative treatments available to patients in order to allow them to accept (or reject) the treatment based on their personal preferences and values. Informed consent reflects not only the prominence of individual self-determination in the modern world; it functions precisely in a social context in which

solidarity or shared commitment to a belief system is rare. To be a therapist of individuals, who are independent and isolated from a wider community of meaning, thus requires that the therapist be similarly severed or disconnected from the community at large. The predictable result is that not binding sentiment, but critical detachment becomes the attitude presumed to be conducive to a sense of well-being in the modern view.

Nurses have identified both positive and negative effects of technology on their practice [9]. On the positive side, nurses have reported that technology has increased their efficiency and saved them time, as well as helped them keep their patients safe by detecting subtle changes in their patients' condition so that they could intervene early to prevent deterioration, injury, complications, and infection. Technology also contributed to shortened hospital stays by promoting healing and helping nurses prepare patients for discharge. In addition, the new technologies better prevented nurses from injuring themselves while providing care. However, there are negatives associated with the new technologies, such as the challenges associated with broken equipment, how to operate/use complicated equipment, and how to keep up to date with changing technologies. Another downside of technology is that it can be addictive. Professionals and the public have come to believe that technology can solve all problems.

We live in a culture fascinated with new technology, almost to the point at which there is overconfidence in what technology can achieve and an overreliance on its use. Many people believe that technology can address and correct what is wrong, repair what is broken, and cure what ails us. Health care professionals are increasingly reliant on these technologies as their primary source of information. At times, technology has diverted nurses' attention away from the patient as a person. In other words, nurses often find themselves watching a machine instead of observing, interacting with, and developing a relationship with the person who is attached to the machine. Direct care of the patient has been replaced by care of the patient via a machine! When nurses view patients in this way, what patients and their families have to say can be more easily ignored or discounted.

HEALTH SERVICES

The new health service reforms have been underpinned by greater investment in hospital building programmes and in target/standard setting accompanied by matching increased diversity of supply with an ability to respond to the new diversity of demand in preventive and curative medicine–tackling the underlying causes of health inequalities as well as providing the best care [10]. Decreased tolerance of failing services will also be a core component of the government's strategic health care plan. A new quality commission will therefore be introduced with tougher powers to impose fines and close down services in the case of poor standards. Foundation hospitals will also be able to take over failing hospitals to turn around their performance and in the case of primary care, there will be greater diversity of supply and strengthening of the power of PCT commissioners to ensure that GP or community health care services can be improved or replaced where they fail to respond to local patient/user demand.

Major advances in technology and bioengineering have also brought about significant changes in treatment patterns and modes of delivery. For example with cutting-edge techniques – ranging from genetics to stem cell therapy – and life-saving drugs to prevent, alleviate or cure conditions such as Alzheimer's disease, it is likely that many of today's diseases will succumb to either eradication or amelioration. Investment in the implementation of world-class research programmes will accompany the government's health care investment plan and new academic health science centres will be sponsored for implementation within our most prestigious foundation trusts and their partner universities. These will facilitate the discovery of new technologies, which, in turn, will enable clinicians the ability to diagnose and intervene at the earliest possible opportunity.

The intersection of integrative healthcare and informatics challenges us to consider the complementary nature of the limits to human cognitive processing ability and the robust computational capacity of current technology [11]. This broader perspective more intimately captures and defines the human linkage with technology, and fosters rigorous discernment of the advantages and disadvantages of technology to humans and integrative healthcare. Integrative nursing offers a perspective of whole person/whole system healing that can humanize and enrich healthcare informatics. We propose that interdependence between integrative healthcare and informatics asks us to protect and

be stewards of a relationship between informatics and integrative health with a strategy that benefits humans.

HEALTH CARE

Technology is also an important part of future endeavors [12]. Technology can provide improvements in care, as seen in both acute and long-term care settings, and improved access to care as seen in the increase of programs delivered by Internet and other telehealth approaches. A good example of improving access to care includes programs to increase health of rural populations. Examples include improving cardiovascular health and weight loss and maintenance for older rural women. Increasingly, research is defining programs that can be scaled up and successfully delivered using technology. Telehealth nursing programs for children and families have been tested successfully and are finding their way into practice.

A patient-focused health care system would necessarily involve cultural competence and understanding of social and community attributes in determining health outcomes [13]. The translation of increasingly sophisticated science and technology into personalized care has been the premier goal of health equity. The past decade has brought new tools and a new language into this arena. There is promise for extending better health care for all with scientific advances. With every advance comes a prospect of side effects. Personalized medicine is an approach that brings high levels of technology and data sophistication to the field of prevention, prediction, and treatment. It is sometimes called "precision medicine." Personalized medicine as a general term suggests greater empathy, patient involvement, and reciprocity in health care services. Although it can and should include those things, the predominant tool in personalized medicine is the application of genomic science. It is not part of a generalized effort for empathy, involvement, and reciprocity. The particular mapping of individual DNA provides more data about individuals, families, and communities. There is dramatic promise in scientific circles about capabilities associated with genetic mapping. In some conditions, such as the field of pharmacogenomics for companion drugs based on genotyping of certain cancers, application of the science yields better clinical decision making and better health outcomes.

TELECARE

Telecare is defined as the use of communications technology to provide health and social care direct to the patient [3]. Earlier development of telecare also referred to assistive technology and smart homes or smart technology. Assistive technology is another collective term for devices for personal use to enhance people's functional ability. It may include fixed assistive technologies such as stair lifts or portable devices such as bath seats. Therefore, this can include telecare, but is not limited to the kind of technology normally considered within eHealth. Telecare Services Association (2016) summarise the definition of telecare as 'support and assistance provided at a distance using information and communication technology. It is the continuous, automatic and remote monitoring of users by means of sensors to enable them to continue living in their own home, while minimising risks such as a fall, gas and flood detection and relate to other real time emergencies and lifestyle changes over time'.

'Telecare' is an umbrella term referring to the technical devices and professional practices applied in 'care at a distance', care that supports chronically ill people living at home [14]. With telecare, the formal or informal carer is not in the same place as the person receiving care. Instead, carers use new communication tools such as webcams, electronic monitors, email and websites to interact with patients, transmit data and provide instruction. Strictly speaking, the telephone is also a distant-care device and it is often central to making telecare practices work. The term telecare, however, commonly refers to the new technical arrangements for care or, as the critics might say, to a new hype in care.

Hype is indeed a part of the introduction of telecare in health care. Innovations in telecare have seen optimists and pessimists hurrying onto the soapbox to proclaim their opposing views. Innovative practices are by definition not well researched, and these soapbox speeches emphasise either their pros – the promises telecare is bound to fulfil – or their cons, the nightmares it will inevitably bring.

Older people, instead of moving into a care institution when their minds and bodies start to fail, will have to stay at home, surrounded by all kinds of cold mechanical devices, receiving no support from caring people. Carers of these alienated people will only discover that someone has passed away when the sensors stop

reporting movement and vital signs. Professionals, often nurses, lie awake, imagining the fate of neglected patients and overlooking serious problems because nobody actually bothers to go out and see these vulnerable patients any more.

BIG DATA

With the ubiquitous availability of health-related data such as insurance claims, discharge abstracts, electronic health records, personal fitness devices or mobile phone applications, the amount of health data is increasing in size, but also in speed and in complexity [15]. "Big data" provides new opportunities for nurse clinicians and researchers to improve patient health, health services and patient safety. Following this unprecedented amount and complexity of information available from different types of data sources, the processing and the analysis of big data challenges traditional analytical methods. For these reasons, a range of analytical approaches such as text mining and machine learning often developed in bioinformatics or engineering fields become of highest relevance to nurses wanting to work with big data.

The rapid digitization of health and health care data is leading to a dramatic growth of information on all levels of the healthcare system. In 2012 it was estimated that worldwide size of digital healthcare data reached 500 petabytes, corresponding to more than 13 years of HD video and is expected to be multiplied by 50 in 2020.

Alongside the question of what constitutes 'big data' and where big data is generated from, a range of analytical techniques, often labeled as "data science", have emerged. Those techniques deal with difficulties from big data files, but also generate new opportunities with big data and data from traditional research designs. In the following sections, we will give a brief overview about the common sources of big data and typical analytical techniques and provide two examples where these techniques have been applied in nursing research. Finally, we will briefly discuss the challenges of big data and give a perspective of how data analytics from big data might influence nursing and nursing research.

EDUCATION

There are multiple formal and informal learning venues for emergency nurses [16]. These include hospital-based in-service education, both of the mandatory and elective varieties;

conferences external to the healthcare institution; and academic programs that lead to a BSN, MSN, MBA, or doctoral degree (DNP or PhD). All certainly have significant value. Ideally, you should take advantage of the offerings as your professional needs, time, resources, and personal circumstances allow. Technology has added to the repertoire of available options. In the past, nursing education has been offered in lecture-based formats for learning. However, many nurses expressed a clear preference for hands-on or case-based learning opportunities. The growing popularity of simulation labs both in nursing schools and in hospitals speaks to the value of both learning and applying new knowledge in a realistic clinical scenario. High-fidelity manikins offer opportunities for full participant engagement in the scenario and hands-on competency development in relation to acquiring or honing practical skills. The use of healthcare actors who play a patient role provides nurses with challenging situations in which interpersonal communication skills may be challenged and ultimately improved. These types of learning experiences are frequently conducted using teams that include physicians, nurses, and allied health personnel to promote more effective teamwork, collaboration, and the development of interdisciplinary competence in patient care.

FUTURE

Technology has historically relieved people of backbreaking drudgery and dreary monotony, providing them with more free time to pursue personal relations and creative activities [17]. Nurses, too, when relieved of routine and time-consuming clerical or managerial paper handling chores, can devote more time to the unique problems and needs of individual patients or clients. Increasingly, across the world, the managerial and clerical paper-handling tasks of nursing are being performed by information systems. In addition, robotics (e.g., lifting and turning patients, delivering medications or meals, and recording temperature, pulse, and other physiological measurements) might assist with the physical care category of nursing tasks. Similarly, decision support systems may actively assist with nursing judgments.

Relieved of routine and less complex chores, the professional nurse having enhanced information management skills and working in an environment enhanced by information systems will be expected to carry out higher level, more complex activities that cannot be programmed.

Nurses are being held responsible and accountable for the systematic planning of holistic and humanistic nursing care for patients and their families. Nurses are also increasingly responsible for the continual review and examination of nursing practice (using innovative, continuous quality improvement approaches), as well as applying basic research to finding creative solutions for patient care problems and the development of new models for the delivery of nursing care. Increasingly, nurses will provide more primary care through community-based programs providing health promotion and early recognition and prevention of illness. Nurses' role as patient educator is being extended by means of multimedia programs and the Internet. At the same time nurses must assume greater responsibility for assisting the public to become discriminating users of information as they select, sort, interpret, evaluate, and use the vast volumes of facts available across the Internet.

In electronic terms, computing is the medium, information the message [18]. The medium is the equipment that provides the connectivity, enabling the microcomputer user to access other computers, other systems. These computers link the user with colleagues, institutions, libraries. The medium provides new tools, giving to the health care professional new capabilities for multiple functions-education, research, clinical care, and management of all these.

This new medium of computing holds our future. It is our charge to use it weIl, to create the information-rich environment where patient care and all the many functions that support it are of the highest quality. As a profession, nursing can do no less.

CONCLUSION

The rapid development of IT technology in medicine is caused by the following reasons: reducing the cost of medical care in many countries, improving the quality of patient care, increasing the efficiency of medical staff and increasing the profitability of health facilities. To ensure the lives of patients, improve the professionalism of medical professionals and health insurance agents, modern innovative technology simply called Healthcare Technology. Its main task is to provide professional medical care to the patient. Of great importance is the ability to interact with health professionals from different medical institutions through online symposia and conferences. This allows them to hear the opinions of more experienced colleagues and solve a difficult problem without leaving the patient.

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