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Dancing Around Technology and Nursing Informatics: Can Wearable Technology
Challenge Educators to Propel Informatics Content into Baccalaureate Curricula?

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Dancing Around Technology and Nursing Informatics: Can Wearable Technology Challenge Educators to Propel Informatics Content into Baccalaureate Curricula?

Technology has become ubiquitous in nursing. The use of technology is no longer limited to high tech care settings such as intensive care, but has infiltrated almost all settings in nursing, migrating easily between personal and professional use. Cell phones are an excellent example of disruptive innovative technology that now seems commonplace. Disruptive innovation, a term coined by Christianson (Dyer, Gregersen, Christensen, 2011), describes a process by which a product initially takes root in simple applications at the bottom of a market and then relentlessly moves up the market eventually displacing established competitors. Disruptive innovative technology may leave a person feeling uncomfortable and uncertain if adopting the change is a good thing. Initially the disruptive technology is not always viewed as an improvement, yet gradually becomes the norm. Cell phones were originally a disruptive technology that became one of the most rapidly adopted tools in the history of technology, first appearing only 10 years ago. Pew research notes that now 91% of all Americans own a cell phone and 64% own a smartphone. In young adults (18-29 years old), smartphone use climbs to 85% (Smith, 2015).

A more current example of disruptive innovation is The Internet of Things (IoT), a term that describes the expanding network of physical objects that feature an internet provider address allowing connectivity and a wireless communication between these objects and other Internet-enabled devices and systems. The IoT significantly changes the relationship between people and devices, and with increased Broadband access, it allows people to share data effortlessly and seamlessly. Connections can be people-people, people-things, and things-things. Increasingly, everyday objects like a refrigerator, car, or baby monitor are designed to have

network connectivity allowing them to send and receive wireless data. Current analysts muse that by the year 2020 there will be over 26 billion connected devices (Morgan, 2014).

One of newest illustration of IoT devices is Wearable Technology. Fitbits, Apple watches, and Google Glasses, all potential disruptive technologies, are appearing on people of all ages. This interactive technology has the potential to alter the entire paradigm of how to motivate people to pursue healthy behaviors by receiving instant feedback. The *quantified self-movement* has blossomed and people are independently tracking their own exercise, sleep cycles, and mood cycles. Analysts at Morgan Stanley predict that wearable technology could have a US \$1.6 trillion impact in the future, far exceeding just the technology industry (Derrick, 2014).

Disruptive Technological Innovation and Nursing Informatics

Nursing education is challenged to prepare students to find new techniques that will inspire patients to improve their health, manage their chronic disease and improve health literacy. Wearable technology is an emerging tool that nurses can study to evaluate its ability to motivate a patient to pursue healthy behaviors. However, this means that today's nurses need to incorporate both technology and the practice of nursing informatics seamlessly as they develop a plan of care. Nursing Informatics is defined by the American Nurses Association (2015) as integration of nursing science with multiple information and analytical sciences to identify, define, manage and communicate data, information, knowledge and wisdom in nursing practice.

As data management becomes a new priority in nursing knowledge and wisdom, translation and interpretation of large amounts of data becomes an essential nursing skill. Nurse as knowledge worker highlights informatics in practice as nurses often serve as information brokers for patients by using technology to help a bridge the gap between information literacy and their desired health outcomes. Nursing Informatics explains how to blend the *science* of

technology use with the *art* of finding data patterns to create individualized choices for patients. Informatics and technology reside symbiotically, advancing and growing together in leaps and bounds as their interdependency deepens. As technology changes exponentially, it becomes vitally important that nursing education prepares entry level nurses to adapt to continual changes in technology as part of their lifelong informatics learning (McGonigle, Hunter, Sipes, & Hebda, 2014). Thus, future nurses can use informatics to help innovate instead of react to technological changes.

Other healthcare organizations are already using innovative technology to explore new ideas for healthcare delivery. In the United Kingdom, patients use wearable technology to track blood pressure and heart rate deviations that are connected to their e-Health record in a cloud based storage system (Sultan, 2014). Family, physicians and/or health professionals can be alerted to go check on the patient in their home if threshold levels are exceeded. Google recently signed a contract with Novartis to produce a contact lens that can monitor blood glucose (Scott, 2014). Physicians are using emerging disruptive technologies like Google Glass to educate students, improve care delivery and documentation as well as aggregate big data (Nostra, 2013; Grossman, 2015; Lesley & Shmerling, 2015; White, 2015). Nursing education lags behind in publishing research that evaluates the use of disruptive innovations, such as Google Glass (GG), in nursing education (Schneidereith, 2015). Innovative devices are a promising tool that allows nurses to share data seamlessly or to improve communication. But, one might ask how entry level baccalaureate nurses are being prepared to think about nursing informatics as a crucial part of their educational outcomes.

Baccalaureate Nursing Education and Nursing Informatics

As the gateway to advanced practice, baccalaureate nursing education is faltering in its ability to simply infuse informatics into the curricula. This is due in part to the fact that the leading professional nursing organizations and accreditation bodies such as the National League for Nursing (NLN) (2008), the American Association of Colleges of Nursing (AACN) (2008), Technology Informatics Guiding Education Reform (TIGER) (HIMMS, 2015), and Quality Safety and Education for Nurses (QSEN) (Cronenwett et. al., 2007) have not reached consensus about what the vision for nursing informatics competencies should be for entry level nursing (Table 1). Rapid advances in technology infusion have left proposed frameworks and some language quickly outdated. In the information age, currency of knowledge, and thus credibility, is visible at the click of a mouse or the brush of a finger on a touch screen.

Table 1

Professional Organizations Visions for Informatics Competencies

Professional Organization	Date of Proposed Competency	Key Concepts and Language Used
NLN	2008	Computer Competency Information Literacy Information Management
AACN	2008	Essential IV: Information Management and Application of Patient Care Technology
TIGER	2007	Basic Computer Competencies Information Literacy Information Management
QSEN	2007	Pre-licensure KSA of Informatics: Use information technology to communicate, manage knowledge, mitigate error, support decision making

Concurrently, teaching with technology in nursing education has sky rocketed as high fidelity simulation is being used to replace clinical experiences, especially in the high risk areas such as maternity, pediatrics, and mental health. The National Council of State Boards of Nursing (NCSBN) supports that up to 50% of clinicals may be replaced with simulation, with a strong caveat of how simulation education needs to be structured (Alexander et. al., 2015). Each baccalaureate program must decide how much simulation they will employ. Each state Board of Nursing has created different regulations surrounding simulation hours replacing clinical instruction; in addition, developing expertise in simulation education requires significant initial investment in faculty development as well as continued investment to maintain expertise. The same investment in expertise remains true for nursing educators who need to bring clinical into the classroom by utilizing an academic Electronic Health Record (EHR) threaded throughout the curriculum. Often faculty must be proficient with an academic EHR as well as multiple EHRs they may use onsite in clinical teaching.

Furthermore, there remain multiple levels and licensure for entry level nursing practice that dilute any one organization or program's ability to focus on developing and defining desired informatics competencies and roles for each individual level of licensure. All of these factors contribute to a widening knowledge practice gap in nursing informatics. Technology use in nursing is more than mastering patient care technologies such as an intravenous pump or cardiac monitor. However, more often than not, educators focus on the task of mastering a cardiac monitor instead of teaching how the technology helps nursing seek data patterns that influence decisions at the point of care. In the end, the lack of visibility or mapping of informatics within the curricula leaves the perception that this is not a valued concept for entry level practice. Future opportunity for research regarding disruptive technology in nursing education is lost when

educators are struggle to recognize that mastering technology use is only one part of nursing informatics competency necessary for entry level nurses.

Issues affecting Entry level Informatics Curricula Integration.

The literature review showed three themes. First, factors such as *technology readiness* of both faculty and students were an element. Less than 14% of the nursing faculty are under the age of 40, with 72% being age 50 or greater (Budden, Zhong, Moulton, & Cimiotti, 2013). This makes a majority of educators digital immigrants who may lack expertise in teaching with and about technology. Available resources and supportive leadership are also identified as two variables that influence technology readiness and strongly influence infusion of informatics in nursing education (McNeil et al., 2003; Warren & Connors, 2007). For example, the average cost per individual student using a high fidelity Sim Man 3G is calculated at \$US 286.16 (Lapkin & Levett-Jones, 2011), a typical cost for individual academic EHR student access for 24 months is \$US 259.95 (Wolters Kluwer, 2015). Faculty development to increase expertise with high fidelity simulation and the academic EHR is an indirect cost expenditure at a time when higher education is struggling to balance shrinking budgets. Faculty often own up to three devices that access the internet to be able to teach with and about technology. Therefore, adding another layer of technology, such as Google Glass, initially beckons and promises a better path, easier workflow, an improved outcome—and yet delivers intense changes. Technology and informatics are clearly woven together and all nurses need to pursue lifelong learning to embrace accelerating technology changes.

Second, there is also intense *competition for curricular content* in an already content saturated framework designed to prepare students for their licensure exam. The National Council Licensure Examination for Registered Nurses (NCLEX-RN) blueprint does not clearly identify

how or even if informatics competency will be evaluated. Multiple choice questions regarding Health Insurance Portability and Accountability (HIPAA) compliance within the electronic health record (EHR), and Protected Health Information (PHI) indicators within a mock EHR screen are potential examples of how informatics knowledge might be loosely mapped in the current NCLEX test map. As of today, there is no hands on evaluation in the NCLEX-RN that requires the applicant to demonstrate minimum levels of competency actively using an EHR, or any other patient technology, to solve a problem. Newer curricular content such as genetics and genomics and interprofessional education also clamor for part of credit load of the undergraduate curricula. In today's economic climate, Higher Education is challenged to prepare students for degrees and transition to employment without additional credit loads.

Finally, Professional nursing organizations such as the AACN, NLN, TIGER, and QSEN have each outlined their *vision for informatics competencies* for undergraduate nurses and there appears to be no clear consensus in the vision. Standardized tools to evaluate nursing informatics competencies remain in their infancy and have not been widely disseminated (Choi & De Martinis, 2013; Hunter, McGonigle, Hill, Hebda, & Sipes, 2014). In part, because there are no standardized languages about definitions and competencies regarding informatics, it is often viewed just as being knowledgeable about using computers; not as for example, as using technology to create and develop new workflow. This leaves nursing faculty wondering which professional organization's vision is most accurate. Confusion leads to disintegration instead of integration of informatics into the curricula.

Current Demand for Informatics Skills

One of the largest drivers for increasing nursing informatics visibility came in 2009 with the passage of the American Recovery and Reinvestment Act (ARRA,2009) (Pub L. 11-5). This

law established incentive payments to healthcare organizations to promote the adoption and meaningful use of interoperable health information technology (HIT), particularly EHRs. When reimbursement for healthcare services was tied to a ‘Meaning Use’ of EHRs, healthcare organizations begin to place value on informatics skills and abilities. As nursing is the largest group of professionals who use the EHR, nursing informatics knowledge skills and abilities are extremely valuable to the organization’s ability to document quality outcomes and capture and maintain revenue streams. In the future, any nursing experience using disruptive technology that can improve communication or documentation will be considered an asset to delivering quality care.

As aggregate data about quality became available in 2008, the Center for Medicare and Medicaid Services (CMS) created a list of 28 events linked to hospital acquired conditions (Mattie & Webster, 2008). These ‘*Never Events*’ would no longer be covered as part of the reimbursement package, forever changing the paradigm of documentation. Most of the never events were tied to nurse sensitive quality indicators documented in the EHR. Nursing knowledge about EHR care documentation and workflow is imperative to reducing costs of hospitalization while demonstrating the value of nursing care. In addition, nursing informatics also helps support evidence based practices and clinical decision tools—both important parts of delivering safe, cost effective, patient centered care in any setting.

With the rise of interprofessional education (IPE), there are mandates from accreditation bodies to show evidence of how students are being educated to collaborate. *Core Competencies for Interprofessional Practice* (IPEC, 2011) is often used as a model to plan curricula. The framework includes four competencies: values; roles; communication; and teams. Clearly

articulated within the communication competency is a statement about how informatics skills are a necessary part of clear communication to enhance team collaboration in the 21st century.

Care delivery models are also changing how teams communicate. One example of informatics communication is the use of telehealth visits to engage interprofessional students in synchronous time, while remaining geographically separated. Another disruptive technology, Google Glass, is used to share salient patient information hands free to maximize interventions between the en route paramedic and the admitting ER physician (Wearable Intelligence, 2014). These examples illuminate a concern about how informatics skills are assumed present in all professions participating in IPE. Nursing voice needs to be evident during exploration and implementation of new technology applications or nursing will be left behind as technology decisions are finalized. If nursing professions want to be included in the future conversations of how to best deliver care, we must be fully prepared to harness technology using informatics to deliver that imagined care. Every nurse needs informatics experience and the natal experiences need to occur in UG nursing education. Spector's (2015) newly released study addressing nurse residency shows that informatics competency is one of the six critical elements of successful transition to practice.

Discussion

Undergraduate (UG) nursing education is poised to engage the creativity and knowledge of our future professionals to practice to the full extent of their licensure. Undergraduate nursing is the conduit to advanced practice and graduates must be fully prepared for successful transition to their unique practice roles. Nursing is mortgaging the future of the profession if it does not choose to aggressively integrate informatics into the UG curricula. Specifically, using new emerging technology into UG education helps demonstrate to students how informatics

competency connects Evidence Based Practice (EBP), information literacy, meaningful use compliance, and health promotion. Disruptive technology engages students' creativity and problem solving abilities while learning to use the technology to deliver care. Future employers benefit when students are prepared to embrace new technology by having a strong informatics foundational knowledge to anchor them.

Entry level nurses need to master the science of technology in order to practice the art of informatics to enhance the overall knowledge and wisdom of nursing. Informatics helps link the *knowledge* pearls of finding, organizing and analyzing data to the *skills* pearls to manage disasters and global health challenges. Nursing education must prepare students to adapt to changing technology quickly. What is seen as disruptive today may be commonplace in practice within a few years. In addition, students need to be able to analyze the value of the technology to articulate how nursing workflow may be impacted and feel empowered to question about how EHR screens are designed, noting if they adequately capture nurse sensitive quality indicators that influence patient outcomes.

In essence, the focal point of UG nursing education should be helping students learn to think, how to communicate using multiple methods, how to access resources, and deliver safe quality care. Educators need to instill urgency for lifelong learning at the same time the student is still immersed in mastering the basic knowledge. Nursing informatics allows nursing to capture and clearly evaluate both the art and the science of nursing practice. It moves nursing into the forefront of care delivery creating both opportunity and risk for the profession.

Possible Solutions

Choosing to ignore the importance of nursing informatics to our professional practice comes with a greater risk to the patients we are charged to serve. In order to improve informatics

integration into the baccalaureate curricula, it must first be more visible in the NCLEX-RN test map so that it is nationally recognized as a valued skill. In the newly released 2016 NCLEX-RN test map, 'information technology' is listed as a related concept under Safe and Effective Care Environments. Information technology is only one part of nursing informatics, and needs standardized definition to be meaningful. If information technology competency is defined as utilizing the EHR, it diminishes the visibility and value that informatics brings to improve health literacy and evidence-based practice. Clearly mapping the NCLEX with informatics concepts, defined with standardized language, communicates a platform of skills that NCSBN expect in entry level competency level of practice.

As the landscape of nursing education tilts to interprofessional care collaboration, professional nursing organizations must claim a shared vision of how *nursing* informatics impacts care delivery and patient safety. Informatics is more than turning on a computer and moving files. One could ask, how are young professionals challenged to transfer personal technology skills into professional informatics skills that improve communication? Part of this engagement starts with faculty using current and emerging technology to stimulate creativity and innovation.

Wearable technology can help IPE team design clinical decision tools that improve clinical decision making at the point of care. In addition, wearable technology like GG could be used to improve communication between providers and within the EHR improving patient safety. As wearable technology use unfolds across personal and professional applications informatics leaps into the present. Established interprofessional organizations such as American Health Information Management Association (AHIMA) or Healthcare Information and Management Systems Society (HIMSS) could be encouraged to actively design comprehensive

informatics care competencies that are used for all health professionals, regardless of their licensure level. Instead of silo informatics competencies, there may be greater strength in collaboratively designed competencies. This proposal might also help nursing evaluate a continuum of Knowledge, Skills and Abilities (KSAs) that can be aligned within the various licensure levels currently in practice.

Conclusion

Nursing informatics is overdue to become a prominent concept within the undergraduate curriculum. Nursing education needs to warmly welcome the idea by making space within the curricula and heavily investing in faculty development regarding informatics and technology. Nursing leadership needs to create a supportive environment and allocate adequate resources for faculty development. If the fear of using disruptive technology in UG education is removed, what emerges is a creative teaching method to illuminate the power and potential of informatics. Nursing education could engage students to design creative solutions for today's communication issues. If nursing education chooses to ignore the potential benefits of disruptive technology, then the profession falters, and the voice of nursing is absent at the decision table. If, however, nursing education infuses the science of informatics and technology into the curricula, nurses can become free to focus on the art of nursing. A primary informatics practice knowledge centers on how to practice technology application without losing sight of caring and intentional presence. "That is why every nurse cannot afford to be unconnected to this transformation, but must take an active role in ensuring that IT is used in service to our professional values. After all, we are the knowledge workers." (McBride, 2005, p. 188).

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