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Success in Nursing Informatics

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The field of Nursing Informatics was initially recognized in the year 1988 as an individual discipline within the scope of the nursing field. The field has grown immensely since the initial inception of Healthcare Informatics, and now systems and professionals are networked over thousands of systems with data read and stored in real time. Today, the vast majority of careers in nursing informatics are dominated by those that hold a Master's Degree in Nursing or at least are certified by the ANCC. These specialists combine clinical knowledge with Information Technology and an ability to educate adults who may or may not have previous experience. Regardless of the new technology available, there will always be a need for information technology (IT) nurses who can effectively implement and maintain an electronic health care system, and can bridge the gap between the IT and clinical professionals. This paper describes the history and speculates on the future of this rapidly evolving field.
The field of Nursing Informatics was initially recognized in the year 1988 as an individual discipline within the scope of the nursing field (Pramilaa, 2013). Today, the vast majority of careers in nursing informatics are dominated by those that hold a Master's Degree in Nursing or at least are certified by the ANCC. These specialists combined clinical knowledge with Information Technology and an ability to educate adults who may or may not have previous experience.

The field has grown immensely since the initial inception of Healthcare Informatics, and now systems and professionals are networked over thousands of systems with data read and stored in real time. Regardless of the new technology available, there will always be a need for information technology (IT) nurses who can effectively implement and maintain an electronic health care system, and can bridge the gap between the IT and clinical professionals.

The current landscape of electronic health records goes far beyond the scope of a single private desktop computer, as they were utilized in the late 1970's through the 1990's. These early machines held text-based documentation in abbreviated file names that did not allow customization, or at best limited customization. At this early stage in digital records (MacDonald, 2007), a complete rewrite of protocols would be required as each user (namely Primary Care Medical Doctors) would have differing opinions that the early systems needed to reflect.

The rewriting of protocols was extremely time consuming and diminished the benefit of electronic documentation as records were not consistent from one provider to another. Worse yet, it required a large amount of time from Information Technology professionals (who rarely
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had a clinical background) to redesign the system as required and point of care staff to enter data. With this occurring, errors were frequent, particularly as data was processed by human staff and entered manually and at times incorrectly transcribed.

Figure 1 Early computerized health record (MacDonald, 1977)

Early systems consisted of a single computer or a simple network that used the punch card system to review and document data. Individual alterations were not read by the system, but were hand-filed into a patient's file. Early on, the framework of multiple systems was suggested, including a change in the way the skills would be obtained and applied on the clinical level (Singh, 2004). These skills would need to be taught by professionals that were dually certified in both the healthcare discipline they serviced, but also in Information Technology to encourage adequate team building and prevent loss of revenue (Singh, 2004).

Few professionals truly looked forward to the future, often promoting within their own ranks, and professional members of the Nursing Informatics field were not properly utilized.
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This caused a delay in implementation of systems and increased errors. The poor implementation and use errors continue today, and a recent article by Kreimer (2015) states that the number of malpractice suits based on electronic health records has doubled between 2013 and 2014.

Moving the timeline to today, the presence of younger and more computer-literate healthcare professionals is being combined in the work force with the older professionals who may not have had any experience with computers until middle age. This results in mixed and inconsistent results for implementation and daily use, and the older user's requirements for training are different than the younger individual, but must be met for successful outcomes. The current recommended curriculum for nursing programs is recommended to include some kind of computer or technology education, as failing to know how to use a computer in the field is comparable to having a new nurse unable to read (Wey-Wen, 2004).

Older individuals require more training time, but if the required training needs are properly addressed, these individuals are able to perform just as effectively as the younger generations (Jones, 2014.) In addition, these older users need more hands-on time and cannot as easily learn in a classroom environment, particularly over long periods of time (Heaggens 2015).

In addition to the decreased proficiency, the older user generally has a negative opinion of technology (Broady, 2010.) These opinions naturally improve as their skill level improves, provided the educator does not leave the student feeling isolated or labeled. New and innovative methods of education are needed, and these potentially include a classroom where students can learn at their own pace, but are held accountable for knowledge these older students are given. This additional training requires the Nursing Informatics discipline to become well-versed in
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adult education and the nursing process to remain effective with the ever expanding and diverse workforce with differing technology experience levels (Booth, 2016).

The framework of today's system is diverse and very complex. Now electronic health records hold not only text-based documentation, but also host images and sound files. In addition, these systems can save robust data and are now able to create models that can be printed in three-dimensional form.

This has opened the door for community-based radiology centers to use a complex framework where x-rays, ultrasound images, and Doppler-based exams are obtained in patient residences when directed by a community physician. This data, obtained in the home or by the bedside, is then sent to a central location over a secure connection where a radiologist or vascular specialist is able to interpret the results. These results are reviewed by experienced radiologists and then disseminated to the community physician and patient who can be confident of the interpreted results. This concept of global medicine requires an extensive framework of systems and staffing education for it to remain viable, and this requires a dually proficient information technology nurse.

Another example would be an echocardiogram that records the measurements of the heart and the chambers of the heart. In some cases, these measurements are then uploaded and sent to another part of the world. This allows data to then be directed to another provider, but instead of simply reading the data and forming an opinion, more advanced results can be obtained. Imagine a consulting surgeon inputting cardiac measurements into a three-dimensional printing program and then duplicating a life-sized heart thousands of miles away (Son, 2015). Not only will this aid in diagnosing of a potential condition, it would allow a potential surgeon to visualize the
patient internally before surgery is performed. This will also require a specialist that combines the clinical and information technology disciplines, and Nursing Informatics will remain at the forefront.

Technology and healthcare will continue to evolve, and will likely improve patient outcomes, but with additional needs and stresses upon an already over-burdened IT framework. The needs of clinical staff development will grow, despite the aged individuals retiring, as new technology will constantly outdistance the previous experience levels. This will make the field of Nursing Informatics grow exponentially and make their presence a more valued resource in the future.

As discussed previously, three-dimensional printing is already in use to build models for analysis. This will most likely be expanded to include biological models of organs and body tissue that can be transplanted into a host. These models will use the host's own cells to remake organs and tissues which will virtually eliminate rejection. Overnight, this approach will cure heart disease, diabetes, liver failure, kidney failure, bowel problems, reproduction difficulties, and countless other ailments that medicine attempts to treat with prescription drugs at this period of history.

Another advancement will be the use of medical nanotechnology, or the use of very small computers to treat disease. Rather than medication or a potential surgical intervention being applied to a patient, these small computers, which are slightly bigger than a human cell, can perform the treatment at the cellular level. Tumors could be removed including all affected surrounding tissue with a more precise method than any human could hope to accomplish. Fractured bones could be repaired with a simple injection of these nanites. These tiny machines
would travel their way to the site and direct osteoblasts (the body's natural bone creators) to create new bone formation or use naturally biodegradable epoxy-like material to repair the bone directly. Instead of using rods, pins, weights, and pulleys to treat fractures over a long period of convalescence, a bone could be repaired in just a few hours with little pain other than the "growing pains" adolescent children experience during a growth spurt.

Another future advancement would be the use of phototherapy to reprogram the brain. Some of these concepts are already in use to treat post-traumatic stress disorder, addiction, and depression (Rutten, 2016), but will be greatly expanded in the future. Harnessing the ability to reprogram some of the brain's processes, phototherapy will be able to "flash" the brain into fighting acute infection, or cancerous growths, or to improve the cognition of a patient. Surgeons may not need to use scalpels in the future, but they will need the assistance from a clinical information specialist.

Another advancement could potentially be the use of robotics and a body-machine link that will allow for remote monitoring and diagnosis of a patient by a physician or clinical professional away from the bedside. This will definitely improve patient outcomes as treatment for life-threatening conditions will be read and administered as quickly as the symptoms appear. Cardiac conditions and acid-base imbalances could be immediately detected and allow for a very rapid medical response. This could potentially remove the need for a hospital visit following a heart attack or respiratory failure through advanced medicine.

Nursing Informatics has grown from the early days of computers where information between systems was transferred in binary paper documents that consisted of punch cards and manual data entry to rapidly evolving system linked together in real time with a desperate need
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for technology-savvy clinical professionals. The field has grown to include educated individuals combined with today's rapidly evolving systems that are tied together with a singular language, allowing the systems to converse in real time. Finally, tomorrow's technology will emerge along with non-surgical alternatives, advanced therapies that will eradicate disease, and the creation of body organs without risk of rejection. They all have one thing in common: they all require professionals trained in the discipline known as Nursing Informatics during implementation and routine practice.
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