

Harbingers of Health Care Information Technology

Karen R. Pope

Harbingers are messengers, change agents, and the voice of the future. The Journal of Informatics Nursing continues its quarterly interview column, which features a health care information technology expert speaking to one of today's many topics of importance and weight to nursing informaticists.



Sue Niemeier

This quarter, we were delighted to spend time with Sue Niemeier, MHA, BSN, RN. Sue is the Chief Nursing Officer of Ivenix, an infusion management and delivery organization. With over 20 years of experience in operations and hospital leadership, she's bridged nursing practice with innovation to support the delivery of safer clinical care. She has held leadership positions within health care IT at smart infusion therapy, medical device integration and RTLS companies.

On Becoming Involved in Nursing Informatics

It's well known that informatics is the alignment of people, process, and technology, and I see my career the same way, much like a Venn diagram. At the intersection of the diagram is a collection of experiences with people, processes, and technology that led me to informatics. Most clinicians would agree that an important skill for a nurse is communication, the ability to effectively speak with the patient and family while being sensitive to their culture, education, and social background. Early in my nursing career, I recognized the importance of people skills, the interpersonal abilities that are critical to fostering relationships. I loved bedside nursing, but I wanted to do more. After much reflection, I decided to pursue a degree in health management and administration so I could contribute to how care is provided.

My career moved into consulting and I worked for one of the big five health care consulting firms at that time. The projects widened my mental lens to look beyond the familiar home hospital and engage with a variety of hospitals and health care organizations around the country, modifying processes and applying best practices. It taught me that every hospital was different and had a unique set of problems, situations, and circumstances. I was drawn to the discipline of project management and I further refined my problem-solving skills. Consulting was an invaluable experience and it taught me a lot about the business of health care, along with importance of clinical leadership and professionalism.

True to being a consultant, you live in hotels and airports, and I wanted to get off the road at some point. I moved from people, process, to technology at Ascension Health. I was provided several opportunities to jointly lead projects throughout their many ministries, including initiatives on medication safety and system efficiency. I think the most notable experience at Ascension Health was the opportunity to shape a study funded through the Robert Wood Johnson Foundation and the Betty and Gordon Moore Foundation. It was a 36-site time and motion study for which I was the national coordinator. The objective of the study was to identify how nurses

spend their time during a shift and to pinpoint variables in the acute-care nursing workplace that can be altered to positively affect efficiency and ultimately, patient safety. I coordinated with the Ventures team, which was evaluating health care start-up companies in their funding portfolio, and in doing so, leveraged many emerging technologies to collect the data for this study. We paired RTLS tags with nurses to capture their movement and location through a nursing unit to see where they are spending the majority of their time. By pairing devices with nurses, we received a wealth of information on where and how fast they were traveling. The technology at the time could not keep up with the speed of the nurses. We also added wearable technologies with participants to assess the physical impact of workload and stress. This was years before the Fitbit or Garmin types of wearables today, so it was very exciting. We also used the tools from Transforming Care at the Bedside (TCAB) and refined them, applying statistical rigor. It helped us reaffirm the data points that we were capturing with the RTLS as well as with the wearables. Purdue's Regenstrief Center for Healthcare Engineering supported the statistical and technical methods for the study, and it helped me understand the importance of data security and warehousing.

This study was a powerful experience and began a new chapter in my life, understanding how passionate I am about health care technology, nursing science, and nursing practice working together. The study's findings demonstrated that nurses spend less than 20% of all nursing time on activities defined as patient care. Other activities that accounted for the majority of nursing time included documentation, care coordination, and medication administration. Only 7% of nursing practice time was dedicated to patient assessment. That was in 2008. Can you imagine where it is today with the EHR? I decided that I wanted to be on the right side of history and develop solutions that addressed these statistics and supported efforts by TCAB that state that 70% of nurses' time should be at the point of care.

After a short time with a RTLS start-up company, I moved to a medical device integration company and led a project to capture data from low acuity monitors, or spot check monitors, on med-surg nursing units. This simple application attached to the vital sign monitor sent validated data, along with annotations, to the EHR and transformed the way vital signs entered the record. The solution is now deployed in hundreds of hospitals in the United States. I also led a project to develop an early warning scoring system using physiological vital signs to detect a patient's decline and potentially reduce failure to rescue events. It was such a thrill to be a part of the solution that could impact lives! This is how I ended up working at an infusion management company today. A mentor once told me to 'turn to the problem that you want to affect.' Knowing that pumps have been problematic for years, I decided to go into the infusion industry to solve problems and develop an infusion pump built on an IT platform to improve clinical quality, operational effectiveness, and ultimately, safety.

On the Difference Between Medical Devices and Consumer Wearables

Wearable devices are growing in popularity among consumers. The devices can track nearly everything, from physical activity to sleep to stress. Although fitness enthusiasts frequently use wearables to track their activity levels and even thwart early disease, patients aren't as willing to make a similar purchase. The challenges with wearables as a medical device is on the regulatory, compliance, and reimbursement side. For insurances to reimburse for measures collected by the device, the wearable will need to be validated for medical relevance and compared against existing FDA-cleared medical devices. The challenge with accuracy and reliability will need to be considered if data from the device will be integrated into the EHR. It is complex, and I am certain that it will continue to evolve over time as we continue to see the popularity of the device in the industry as well as the need for more remote management.

On Key Themes Today Regarding Medical Device Integration (MDI)

There are three themes. Medical devices generate huge amounts of actionable, timely data about the patient and the device itself. A medical device is more than just a physiological monitor, but it's also a ventilator, hemodialysis device, incubator/infant warmer, oximeter,

or even something as simple as a urometer, thermometer, or pupillometer. All of the devices can export data. However, a large percentage of the device data is tossed to the side. We need to think about medical device integration more broadly; it's more than documentation to the EHR. The data can help us understand how the nurse interacts with the patient while at the bedside, the study of real nursing practice.

The second theme is that device integration is not within the four walls of the hospital but it is all the points in between (e.g., clinics, surgical centers, long-term care, and even the home). The data from devices used in those environments can be sent to the EHR. It's not just from an episode of time from within the hospital. It's real-time data on how patients work and function within a day. We hopefully will be able to mine the data and pull from it specific points to improve upon. This is an emerging theme that I am seeing.

Finally, the third theme is cracking the nut for truly integrating infusion pumps – and that's a tough one because people are anxious about truly integrating their pumps end to end – but it is achievable and is receiving a heightened focus today. I am optimistic that more and more pumps will be connected in the future and it will create a safer environment for the patient. Several infusion pumps on the market currently are built upon technology that is 10-15 years old. Think about that. Pump technology was put into place around the turn of this century; think about what you were doing technology-wise at that time. For example, if you had a desktop computer from

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2001 and compared it to tablet or smartphone from 2017, it's radically different. The next generation of intelligent infusion pumps is basically a computer that pumps fluids. Interoperability requires a system like this. Otherwise, we're just retro-fitting a medical device that was not designed to operate in this manner.

On Issues Integrating Infusion Pumps to the EHR and How Nurse Informaticists Can Tackle Them

It is a lot to think about as far as issues with smart infusion pumps. We know interoperability is paramount and, as a nurse informaticist, what do you do? It's critical to understand the current state of how nurses deliver medication within the facility. This requires the nurse informaticist to talk with the nursing staff and observe the entire medication process. Observe how mobile workstations are actually used with medication delivery – are they in the patient room, the hallway? Are policies followed? Investigate how nurses use the barcode scanners and if they are tethered or wireless. Are the scanners charged, and where do they charge them? Integration of pumps requires knowledge about the wireless infrastructure. Are there places that are dead spots in the hospital that need to go away because we need pumps operational all the time? These are all things to consider as one is going through the process for smart infusion pumps.

A lot of information can be generated from infusion pumps for surveillance and visibility of the status of the infusion (e.g., how much fluid has been delivered when a pump alarms due to low volume), as opposed to entering a patient's room. This information allows the

nurse to know ahead of time and thus have a more meaningful interaction at the bedside, instead of running in and out to get another bag of fluid and only having just enough time to quickly ask if everything is okay. In keeping with the current focus on alarm management as required by the Joint Commission, alarm data from pumps can be sent directly to the right person, reducing fatigue and patient dissatisfaction. And the environment is much quieter, supporting healing, HCAHP efforts, and ultimately, value-based incentive payments. In the increasing digital world, we must be mindful of security and data fluidity. For the next generation pump, appropriate safeguards should be in place to reduce the risk of pump failure due to cybersecurity threats. This holds true with all medical devices, but with pumps, there is heightened awareness based on the bi-directional data sharing and auto programming. These all tie together regarding what a nurse informaticist needs to be considerate of with smart infusion pumps; there are a lot of issues out there, which are all well-known and documented. It is important to keep in mind that there are a lot of wonderful initiatives on the horizon. The FDA has formulated strict guidelines for all smart pumps released after 2014 so the industry is changing. Next generation pumps are truly computers and fully capable of integrating to the medical record as well as sharing the right data with the right people so they can make the right decision while at the bedside. So, it's a whole different world, which I am certain we will be immersed in over the next several years.

On Advice for New Nurse Informaticists

The most important thing is to get involved, not as a passive observer, but to be active in the conversation and to ask questions. Look to solve problems. Collaborate with other specialties and disciplines including consultants, human factor specialists, workflow experts, those very involved in EHR deployments, project managers, and even vendors. Learn from them and that will help to build upon those life experiences. Respectfully disrupt – it's okay to draw outside the lines – that's where innovation happens. Don't be afraid to partner or talk with device manufacturers or IT solutions if you have ideas that really impact safety, efficiency, **and usability**, which is significant and often overlooked for nurses. We also, as nurse informaticists, need to be thinking of multi-generational needs and styles of learning and working with computers and technology. And, again, it is key to blend nursing practice and nursing science with technology to really ignite change. It's our time to help reshape health care and bring it into the digital age. It is an exciting time to be a part of this field. I would encourage those who are new to it to just ask those questions and get involved. That's the first step!

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