

New Nursing Care Delivery Models through Real Time Learning Health Systems

Susan C. Hull MSN¹, Michael Wang MBA², Dana Womack PhD³, Rosemary Kennedy PhD⁴;

¹Gartner, San Francisco, CA, USA; ²Inspiren, Brooklyn, NY, USA; ³OHSU, Portland, OR; ⁴Care Informatics, Philadelphia, PA.

A general description of the panel and the issue(s) that will be examined and a brief description of each panelist's presentation

Today's care delivery platforms are changing the nature and location of care and how health and services are coproduced, untethered by walls or geographical setting. Real time digital health data generated by the patient and about the patient including interactions with the nurse, care partners, and the environment, offer feedback loops to shape the design and evaluation of care interventions and care models. Nurses are leveraging smart devices, sensors and wearables, and digital twins¹ of clinical operations, workplace data, and patient care interactions for real time adaptive learning and collaboration. The use of AI, algorithms, machine learning, advanced computer vision, and environmental sensing technologies require a next generation of decision support for shared care activities with patients. Informatics nurses are in key roles to partner with nurses across diverse settings to effectively integrate these novel data and technologies with electronic and personal health records and medical devices. This panel will present three case studies leveraging real time digital health data to shape the design and evaluation of interventions and care models. Participants will be able to explore ways to leverage the use of smart devices, sensors and wearables, and digital twins for real time learning and care delivery design.

Panel Member 1: Panel organizer and moderator

Susan C. Hull MSN, RN-BC, NEA-BC, FAMIA, Senior Director, Analyst, Gartner

Panel Member 2: Michael Wang, RN, MBA, Founder and CEO Inspiren

Iterative design of a virtual patient care assistant to support real time nursing care

This case study will review the iterative engagement and development of a smart device and nursing care AI based ecosystem that uses computer vision, deep learning and body movement recognition to monitor and support nursing care environments, patient, and staff interactions. The new technology, developed by nurses for nurses, automates patient safety monitoring, supports real-presence patient feedback and adaptive call bell integration, provides intelligent

¹ A digital twin is a digital representation of a real-world entity or system. The implementation of a digital twin is an encapsulated software object or model that mirrors a unique physical object, process, organization, person or other abstraction. Source: <https://www.gartner.com/en/information-technology/glossary/digital-twin>

environmental sensing, engages staff in visualizing and managing their nursing care, and supports leadership rounding.

Panel Member 3: Dana Womack, PhD, RN, Assistant Professor, Department of Medical Informatics & Clinical Epidemiology and School of Nursing, OHSU

Secondary use of hospital workplace data to sense when staff are adapting to high time pressure and detect patients at risk for delayed or missed care

Hospital-based nurses can experience multiple workload fluctuations in a single work shift, yet automated sensing of periods of time when staff are adapting to high time pressure, and patients may be at risk for delayed or missed care is uncommon. During periods of high time pressure, nurses utilize common adaptive work strategies, such as asking another RN to administer a medication for them. In this panel presentation, we will review findings from an exploratory study that sought to determine whether echoes of nurses' adaptive work strategies may be observable within log files and transactional records produced by hospital electronic systems as a byproduct of care delivery. In the future, automated detection of signs of strain through secondary analysis of workplace data may foster proactive intervention to mitigate RN overload and missed or delayed patient care.

Panel Member 4: Rosemary Kennedy PhD, RN, MBA, FAAN, CEO, eCare Informatics

In-home remote monitoring of oncology patient's physical parameters, patient symptoms, and home characteristics shows promise for early nursing detection of patient deterioration

Oncology patients receiving treatment for chronic conditions often experience debilitating side effects, including nausea, vomiting, fatigue, infection, and sepsis². If the symptoms are not handled well, it hampers quality of life and increases likelihood of un-necessary emergency room visits and hospitalizations^{3,4}. In-home remote monitoring of physical parameters, patient symptoms, and home characteristics shows promise for early detection of patient deterioration. Preliminary results from a Remote Electronic Patient Monitoring Study and Digital Health Solution will be reviewed. This is an IRB approved study to evaluate the feasibility, acceptability, and impact of a remote patient monitoring solution. This technology is used by high-risk oncology patients in the home for early detection of complications such as infection, sepsis, toxic reaction to chemotherapy, pain, vomiting, and dehydration. The solution entails use of body worn sensors which collect continuous vital sign data combined with patient entry of patient reported outcomes (PROs), symptoms, and social determinants of health (SDOH). Through use of machine learning and embedded algorithms, patients are triggered to enter PROs (using a smart phone) and nurses are notified when patient data are out of normal range.

² Nayak, M., George, A., Vidyasagar, MS, et al: Symptoms experienced by cancer patients and barriers to symptom management. Indian Journal of Palliative Care. Sep-Dec; 21(3): 349–354. doi: 10.4103/0973-1075.164893; 10.4103/0973-1075.164893.

³ Smyth EN, Bapat B, Ball DE, et al: Metastatic Pancreatic Adenocarcinoma Treatment Patterns, Health Care Resource Use, and Outcomes in France and the United Kingdom Between 2009 and 2012: A Retrospective Study. Clin Ther 37:1301-16, 2015

⁴ Von Hoff DD, Ervin T, Arena FP, et al: Increased survival in pancreatic cancer with nab-paclitaxel plus gemcitabine. N Engl J Med 369:1691-703, 2013

Collectively the solution facilitates communication between the patient and the nurse, while using machine learning and algorithms to proactively identify and treat complications.

A list of possible discussion questions to enhance audience participation.

- Digital Twin is a new term to me. What is the relationship to the real time learning health system?
- How can remote patient monitoring tools in the home extend and coordinate with technologies being used in inpatient or post-acute care settings?
- What is the impact of digital health solutions on nursing care delivery models and nursing informatics?
- What ethical questions are emerging with patients, family caregivers and colleagues with the use of these AI enabled technologies?

An explanation why the topic of this session is timely, urgent, needed, or attention-grabbing.

These emerging technologies with new sources of real time data are enormously disruptive to current care delivery models, but at the same time, ruthlessly efficient. The digital platform combined with analytics keep the patient and nurse connected despite geographical separation. This shifts the care location to anywhere, which forces a rethinking of nursing practice, from a location to ubiquitous care delivery. It also shifts to a patient centric model which is participatory, and personalized. Nurses will have access to new sources of data, based on machine learning, algorithms, and analytics, which will inform nursing practice in real time. Informatics nurses are in key roles to partner with nurses across diverse settings to effectively integrate these novel data and digital technologies for new care delivery models.

A statement from the panel organizer that all participants have agreed to take part on the panel.

All panel participants named have agreed to take part in the panel.