



Case studies of IT sophistication in nursing homes: A mixed method approach to examine communication strategies about pressure ulcer prevention practices



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ABSTRACT

Most nursing homes lack information technology (IT) for supporting clinical work in spite of its potential to improve the safety, quality, and efficiency of nursing home care in the United States. Increased attention to medical error and concern for patient safety have prompted general recommendations to develop sophisticated technologies to support clinical decision making at the point of care, to promote data standards in electronic records, and to develop systems that communicate with each other. However, little is known about what IT applications best support communication and risk assessment practices to improve resident outcomes in nursing homes. Thus, the overall aim of this study was to evaluate how differences in IT sophistication in nursing homes impact communication and use of technology related to skin care and pressure ulcers. We used a mixed method approach to conduct case studies on two nursing homes – one with high IT sophistication and one with low IT sophistication. Observational analysis and social network analysis were used to identify patterns in communication types and locations; also, focus groups were conducted to explore communication strategies used by Certified Nursing Assistants (CNAs) to support pressure ulcer prevention practices. Overall, results from social network analysis of observational data indicate that direct interactions between CNAs and registered nurses (RNs) or licensed practical nurses (LPNs) were more frequent in the low IT sophistication home and occurred in more centralized locations (e.g. the nursing station) compared to the high IT sophistication home. Moreover, these findings are supported by focus group results, which indicate that the high IT sophistication home had more robust and integrated communication strategies (both IT and non IT) that may allow for interactions throughout the facility and require less frequent face to face interactions between CNAs and RNs or LPNs to verify orders or report patient status. Results from this study provide insight into the design and assessment of different forms of communication to support clinical work in NHs.

Relevance to industry: Nurses bear great burdens for nursing home care; yet, issues persist with poor quality, variable performance of caregiving, and lack of implementation of proven care interventions. One new hope for improvement in nursing home care is the introduction of IT to improve communication, clinical decision-making, and quality of care.

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1. Introduction

Healthcare delivery reached a tipping point in 2009 with the passage of the American Reinvestment and Recovery Act (Valdez

et al., 2010). The federal government invested \$25.8 billion in health information technology (IT) (Department of Health and Human Services, 2010), which is a high priority for long-term care (LTPAC Health IT Collaborative, 2010). Current national priorities for Long Term and Post-Acute Care settings, including nursing homes (NHs), are adoption and use of health IT and electronic health records (LTPAC Health IT Collaborative, 2010). Rationale for these national priorities emphasizes importance of adoption to improve quality and continuity of care for 1.5 million chronically ill

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residents' living in U.S. NHs (Committee on Data Standards for Patient Safety, 2003). Better quality and continuity will prevent chronic illness exacerbations resulting in health status changes, hospitalization, complex treatments, and high cost (Kane, 1999). Annual costs for long term care in the U.S. have reached over 200 billion dollars with 69% being paid by Medicare and Medicaid (U.S. Department of Health and Human Services, 2010).

Currently, we do not know which IT applications or capabilities are best suited to improve NH residents' outcomes (U.S. Department of Health and Human Services, 2010). However, results of our prior research confirms that increasing IT Sophistication (ITS) in NH resident care does correlate positively with nationally reported NH Quality Measures, including residents with declining activities of daily living and those with incontinence, which contribute to more positive outcomes associated with skin integrity and pressure ulcers (Alexander and Madsen, 2009). The purpose of this manuscript is to provide results of two case studies of two NHs with diverse ITS. Our overall goal was to evaluate how differences in ITS in NHs impact communication and use of technology related to skin care and pressure ulcers. In each NH, we explored what communication strategies were used by NH staff to provide care to residents at risk of skin breakdown and pressure ulcers. Furthermore, we explored what evidence based pressure ulcer preventions associated with risk assessment and skin care were used by staff in NHs with diverse ITS. Finally, we used a social network analysis tool called ORA developed by the Center for Computational Analysis of Social and Organizational Systems (CASOS) at Carnegie Mellon to illustrate social networks surrounding Certified Nurse Assistants (CNAs) who were observed in the two facilities during the study. Metrics used to evaluate social networks provide valuable insights into workflow enhancements or interruptions that can have positive or deleterious effects on quality of nursing work (Carayon et al., 2010). Based on our results, we offer some design implications related to ITS.

2. Conceptual model

Human-factors principles relate to how humans accomplish work-related tasks in the context of human-machine systems (Meister, 1989; Salvendy, 1997). These systems can be used to determine how NHs reporting greater levels of ITS improve communication about pressure ulcer prevention measures. Human-

factors models incorporate a strategic focus on operators, machines, and environments (Czaja, 1997; Helander, 1997; McCormick and Sanders, 1982). Building on this human-machine system model, a conceptual model relating current and ideal states of NH ITS was developed for this work. Fig. 1 illustrates the model and how IT capabilities, such as clinical decision support systems found in NHs with high ITS, aide in problem recognition and lead to clinical actions resulting in improved resident outcomes. We believe that resident outcomes will improve as NHs implement these functionalities into bedside care, as providers use them more, and as they are integrated with other systems, such as electronic nursing documentation systems. This conceptual model guided our mixed-method examination of associations between overall ITS and NH communication strategies.

The conceptual model in Fig. 1 contrasts NHs that do not have (Current State) the capability to enter resident assessment data into an IT system with NHs that do have such systems (Ideal State) (Alexander et al., 2010; Liu et al., 2009). In the Ideal State, any type of healthcare provider can enter data. The IT algorithms used in ideal states have predetermined clinical criteria that link to assessment data, such as “no incontinence” that are compared to data providers enter, such as “resident has increasing incontinence”. When preset criteria are not met by resident data entered into an assessment, the clinical decision support system generates electronic alerts, such as a “skin integrity alert”, which can be sent to healthcare providers. The scenario in Fig. 1 includes a skin integrity alert that can be turned on for a number of reasons, including when an RN/LPN or CNA documents that a resident is comatose, has increased edema, is experiencing increasing incontinent episodes, or when turning repositioning has not been documented. The predetermined criteria can be set by vendors and can often be manipulated by the administrator of the decision support system (Alexander et al., 2007). When an alert is issued, the system automatically sends a message to the user (RN/LPN/CNA) that a potential problem has been identified. This is a prompt for the staff to investigate the problem. Previous work has established that NHs that implement IT with these capabilities demonstrated sustained improvements in quality measures three years after implementation, however costs for maintaining these systems were not neutral (Rantz et al., 2010).

IT innovations have the potential to change the clinical practice paradigm in NHs by changing the way providers monitor and communicate patient needs and care processes. This is demonstrated

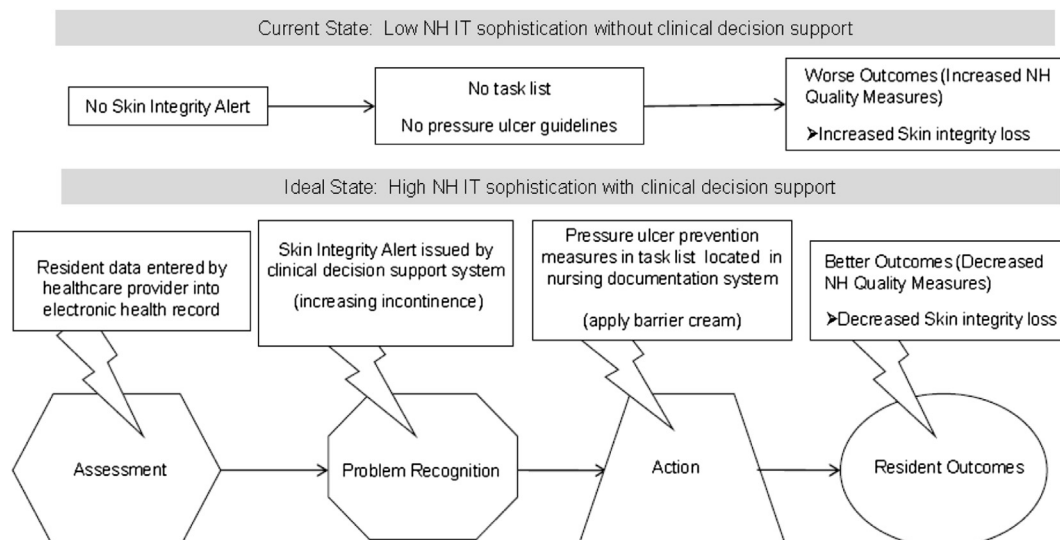


Fig. 1. Current and ideal state models for low and high IT sophistication in NHs.

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