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Original Study

Development of an Applied Framework for Understanding Health Information Technology in Nursing Homes

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A B S T R A C T

There is growing evidence that Health Information Technology (HIT) can play a role in improving quality of care and increasing efficiency in the nursing home setting. Most research in this area, however, has examined whether nursing homes have or use any of a list of available technologies. We sought to develop an empirical framework for understanding the intersection between specific uses of HIT and clinical care processes. Using the nominal group technique, we conducted a series of focus groups with different types of personnel who work in nursing homes (administrators, directors of nursing, physicians, mid-level practitioners, consultant pharmacists, and aides). The resulting framework identified key domain areas that can benefit from HIT: transfer of data, regulatory compliance, quality improvement, structured clinical documentation, medication use process, and communication. The framework can be used to guide both descriptive and normative research.

There is mounting evidence for the benefits of Health Information Technology (HIT) in the nursing home setting. Several studies have reported on improvements in quality associated with the use of computerized decision support and other specific features.[1–4] Although the level of adoption of HIT by nursing homes is increasing, there is considerable room for improvement.[5–10] Much of the research on adoption has attempted to determine whether nursing homes make use of various standard HIT functions (eg, computerized physician order entry, electronic prescribing, or medication reconciliation). There have been several "taxonomies" that identify a large array of potential uses of HIT[11]; however, there is a need for a conceptual framework that links HIT functions to clinical care practices with sufficient precision to be able to generate testable hypotheses about the link between adoption and quality outcomes. This article therefore presents an empirically derived framework for understanding and measuring the actual application of HIT to the daily work of a nursing home.

Background

HIT can be defined as the electronic storage and retrieval systems that support clinical, financial, and operational needs of health care providers.[12] This has typically been operationalized as a list of key systems or features: electronic health or medical record, electronic prescribing, physician order entry, and decision support.[13] Although the focus for health services research has been on systems that directly affect quality and efficiency of care delivery, it is important to note that information technology has long been in place in nursing homes to support accounting, human resource, and regulatory compliance. For example, a nominal degree of HIT use is driven by the Centers for Medicare and Medicaid Services requirement for all US nursing homes to submit Resident Assessment Instrument data electronically.[14]

There have been several efforts to develop taxonomies for understanding the use of HIT in the nursing home setting.[11,12] The Institute of Medicine[12] identified certain key functionalities for electronic health records: health information and data, results management, order entry/management, decision support, electronic communication and connectivity, patient support, administrative processes, and reporting. These functionalities are thought to have the potential, if implemented, to improve quality and safety; however the list is very general and does not address the specific needs of long-term care environments. An alternative set of functions proposed for the

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long-term care setting included census management, supportive documentation, point-of-care, assessment and care planning, electronic prescribing, computerized physician order entry (CPOE), electronic health records (EHRs), and telehealth.[13] A comprehensive taxonomy was developed to reconcile the differences and overlap between these 2 approaches.[11] This includes the following domains: administration, operations, EHR, medications, and telemedicine. Each domain contains a detailed list of features; for example, the EHR contains decision support, triggers for needed risk assessments, and results interpretation.

Several studies have sought to provide an estimate or snapshot of the stage of adoption of HIT in the nursing home sector. For example, Poon et al[15] convened a series of stakeholder panels to arrive at an estimate of the degree of adoption across different parts of the health care system. Their conclusion at the time, based on a consolidation of expert opinion, was that nursing homes lag substantially behind ambulatory and inpatient settings in terms of using HIT for result viewing, EHR, CPOE, and patient-doctor communication. Alexander and Wakefield[8] conducted a series of focus groups and interviews with stakeholders from 4 nursing homes with a high level of HIT adoption. They examined the degree of functional, technological, and integration sophistication across resident care and clinical and administrative domains. Even among a convenience sample of early adopters, they found that the use of key features, such as alerts, was inconsistent. Chan[16] used data from the 2004 National Nursing Home Survey (NNHS) to report on nursing home organizational characteristics associated with use of HIT for drug dispensing and medication administration records (MARs), but found few associations in multivariate analysis. Resnick et al[6] and Davis et al,[17] also using the NNHS, found that nursing homes that were larger, or part of a corporate chain, were more likely to use HIT for clinical functions such dietary, CPOE, EHR, or MAR. Tracking daily care by nursing assistants was the least commonly used function.

Wagner et al[9] examined barriers to adopting HIT for the specific task of preventing adverse drug events (ADEs). They found a very low prevalence of computerized systems that would facilitate reporting of ADEs; only 15% used a computerized order entry system. Sharkey et al[18] examined factors associated with successful implementation of a HIT-based system for pressure ulcer prevention. Those facilities that achieved a high level of implementation were characterized as having high levels of participation from senior leadership and mid-level management as well as a culture that supports organizational change. Similar factors appear on Cherry's[19] tool for assessing organizational readiness to implement HIT.

There have been several studies that looked at specific outcomes associated with HIT implementation. Fossum et al[2] showed that nursing homes using a computerized decision support system for preventing pressure ulcers and malnutrition had very modest effects. Rantz et al[3] reported that the use of a point-of-care documentation system and EHR was associated with higher costs and some improvement in several resident outcomes. Subramanian et al[1] reported that a decision support system for residents with renal insufficiency was associated with lower drug costs, but higher laboratory costs, concluding that the benefits of such systems are more likely to be seen in improved quality and safety.

In summary, although there is a growing body of research around HIT in nursing homes, there is an important gap in the literature. The existing taxonomies and lists of features can be used to measure the presence or absence of a particular system; however, they do not address whether HIT is being applied to specific clinical care issues. The qualitative approach taken by Alexander and Wakefield[8] is an important step in this direction; however, there remains a need for an approach that permits a quantifiable assessment of day-to-day use across a wide range of practical tasks. This article, therefore, presents an empirically derived framework for understanding and measuring the actual application of HIT that bridges the generic gap between taxonomies and the application to specific clinical care processes.

Methods

The goal of this study was to identify care processes in the nursing home that could benefit from the use of HIT from the perspective of multiple stakeholders: midlevel practitioners (ie, adult, family, or geriatric nurse practitioners and physician assistants), certified nursing assistants (CNAs), consultant pharmacists (ie, RPh and PharmD), physicians (including but not limited to medical directors), directors of nursing (DONs), and nursing home administrators (NHAs). We held nominal group technique (NGT) sessions with representatives of each group. The results of those sessions were then analyzed by the study team to produce a conceptual framework that can be used to guide future research.

The Nominal Group Technique

The NGT is a research methodology used to build consensus around a set of ideas that come from the participants.[20–22] It is similar to a focus group in that individual participants are encouraged to think creatively and make contributions in a nonjudgmental environment, and has been applied successfully in the nursing home setting.[23] It also has aspects of "Delphi" or modified Delphi approach, wherein the suggestions made by group members are processed by the group during the session.[20] Each session consists of 4 distinct steps: generating ideas, recording ideas, discussing and clarifying ideas, and prioritizing ideas. Unlike a traditional focus group, however, an NGT session proceeds with one very specific guiding question. The question used in our study was, "Which care processes in the nursing home would most likely benefit from the application of health information technology?" This question was chosen by the study team based on an extensive review of the literature on HIT in general and in the nursing home environment in particular. Our goal was to encourage participants to think about their work, what they do on a daily basis for the residents they take care of, and consider how HIT might provide some benefit. It is important to note that we did not ask them about technology per se, but about the use to which technology can be put. Thus, our intention was to learn, from the perspective of multiple stakeholders, what aspects of their work can potentially be automated. This is distinct from asking them how they could use a particular piece of hardware or software, and did not rely on knowledge of any particular product currently on the market. The expectation was that people identify practical applications for HIT and potential future directions for new product development.

During the NGT session, the guiding question was projected onto a screen using a laptop and projector. After a few minutes of discussion, participants were handed a set of blank index cards, and then given approximately 15 minutes to write down as many answers to the guiding question as they could. Next, the facilitator went around the room, asking each person to read one of his or her cards. The answers were typed onto the laptop and projected on the screen. Participants were encouraged to read all of their cards and not prejudge their own ideas, but were told they could skip redundant suggestions. This continued until all distinct ideas had been nominated. Next, the group discussed each idea in turn, clarifying the concepts, combining similar ideas, and separating those that had multiple, distinct aspects. At the end of this step, each concept was numbered in an arbitrary order.

The next step, prioritization, was a 2-part process. First, each person was given 5 "voting cards" and was instructed to select the 5 most important care processes from the list on the screen. They were told to write the number and an identifying phrase on each card. The group was given a few minutes to complete this task and carefully consider their choices. Then they were asked to identify the most