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Original Study

Health Information Technologies: Which Nursing Homes Adopted Them?

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A B S T R A C T

Purpose: Long-term care facilities have lagged heavily behind other health providers in adopting health information technology (IT). This article examines the facility characteristics that are associated with health IT adoption.
Design and Methods: This study is a secondary data analysis of information gathered between 2005 and 2011 about nursing facility characteristics contained in the Online Certification & Reporting (OSCAR) files and information about health IT adoption in each nursing home contained in the Healthcare Information and Management Systems Society (HIMSS) Analytics Database. Multivariate regression analysis is conducted.
Results: Nursing homes with licensed nursing staff levels above the state average were 20% more likely to adopt computer-provided order entry (CPOE) than homes with licensed nursing staff below average. Resident resources (more Medicare-paid patients and fewer Medicaid patients) were positively correlated to health IT adoption, particularly to a clinical data repository (CDR), clinical decision support systems (CDSS), and an order entry (OE) system. Other characteristics, including chain affiliation, ownership, and market competition, are also related to some health IT adoption within nursing homes.
Implication: Nursing homes with more personnel or resident resources are more likely to adopt health IT. Other factors such as market competition are also important predictors. Future research is needed to examine what factors motivate nursing homes to adopt health IT.

Over the past 2 decades, health information technology (IT) has been recognized as one of the most effective means to facilitate care continuity and coordination, improve quality and effectiveness, and reduce costs and medical errors of health care services in primary care settings such as hospitals and emergency rooms.[1–4] Therefore, the US government has launched extensive efforts to promote health IT adoption among all kinds of health care providers as a means to improve patient-centered care quality and reduce medical costs.[5,6] These efforts include the federal Health Information Technology for Economic and Clinical Health Act of 2009, which provides financial incentives to encourage health care provides to adopt health IT systems.[7] In addition, the American Recovery and Reinvestment Act, signed into law in 2009 under the Obama administration, has provided approximately $19 billion in incentives for hospitals to shift from paper to electronic medical records. Recently, various reports have shown a steady increase in health IT adoption across different health care settings, although studies have shown mixed results regarding the impact of health IT adoption on outcome measures.[8–12]

Long-term care facilities have lagged heavily behind other health care providers in adopting health IT. In 2004, only 1% of skilled nursing facilities in the United States had adopted computerized provider order entry (CPOE).[13] Based on the National Nursing Home Survey conducted in 2004, studies have documented that 82% of nursing homes used electronic software to submit their Minimum Data Set (MDS) data to the Centers for Medicare and Medicaid Services.[14,15] Despite the high level of usage of this MDS software, only one-third

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were using the program's more complex features, such as medication tracking and the clinical decision support system, even though these types of technologies can effectively improve patient safety and quality of care.[16–20] Recent studies conducted in California, Minnesota, and New York reported a 20% to 32% rate of electronic medical records implementation in nursing homes.[21,22] Whether such an increasing trend toward health IT adoption is applicable to all nursing homes in the United States is not yet clear.

Representatives of the long-term care industry and health IT vendors continue to assert the many benefits of health IT in long-term care, and widespread adoption is likely to be inevitable over time.[23] However, data on current health IT adoption in nursing homes is available on only a limited basis. A recent study examining organizational factors associated with the use of information systems in nursing homes focused on chain affiliation and ownership status and found that organizations that were not-for-profit and members of a chain were more likely to use information systems.[23] These findings were based on 2004 survey data of nursing homes, and thus the results are outdated. In addition, organizational characteristics are multidimensional, including more than chain affiliation and ownership status; other factors, such as size, occupancy rate, and market competition also may contribute to nursing homes' decision-making processes in adopting health IT.[24–26] Responding to the current knowledge gap, this study uses a national, panel nursing home survey of health IT adoption and links it with Online Certification and Reporting (OSCAR) files to address 2 questions: First, what has been the national trend on health IT adoption in recent years? Second, what facility characteristics are associated with health IT adoption in nursing homes, and what were the market conditions promoting such adoption?

Methods

Hypotheses

Health IT adoption requires more than designing or buying a system. It involves organizational change, which requires strong leadership, clear formation of objectives, solving existing organizational and interpersonal problems, and establishing psychological ownership of the project from all staff.[23,24] Facilities with a large stock of resources may be more likely to make big investments, such as adopting health IT. Facilities' stocks of resources are measured by a series of facility characteristics, consisting of residents, staffing, and other features.[25] Resident resources are indicated by the payment source: Medicare, Medicaid, or private paid. Having a high proportion of Medicare patients suggests that a facility admits a large number of short-stayers who receive post-acute recovery care and need aid for only a short period of time, usually following a hospitalization for injury or illness.[26] Medicare patients are more profitable to a facility due to providing higher reimbursement rates than Medicaid patients.[27] Hence, a nursing home with a high proportion of Medicare residents may have greater access to financial resources and thus may be more likely to adopt health IT than a facility with a low proportion. Another consideration is the kind of care a facility provides. As compared with custodial care, which provides long-term nonmedical assistance with the activities of daily living, post-acute care refers to a range of intensive medical care services that support an individual's continued recovery from illness or injury.[28] Nursing homes providing post-acute care may require intensive communications with the hospitals where the patients are transferred from. The communication creates great incentives for nursing homes to adopt health IT so as to be interoperable with hospitals.

Hypothesis 1

Nursing homes with more Medicare patients (or fewer Medicaid patients) are more likely to adopt health IT.

Licensed nursing staff, including registered nurses and licensed practical nurses, usually have better educational attainment[29] and are more likely to have the requisite computer skills to learn and use health IT properly.

Hypothesis 2

Facilities with higher levels of licensed nurses will be more likely to adopt health IT.

Large facilities (ie, large bed counts) and facilities with high operational efficiency (ie, a high occupancy rate) usually command greater internal resources, including the availability of additional staff and assets, and are thus more capable of accommodating environmental demands for health IT through internal restructuring than are smaller facilities. Similarly, chain membership may signify resource availability, particularly access to capital for service development, and thus provide resource flexibility in response to a changing environment. Finally, for-profit organizations are more efficient and profitable than not-for-profit organizations,[30–32] thus they may have more resources to invest in health IT adoption.

Hypotheses 3a to 3d

Nursing homes with (a) large bed size, (b) high occupancy rate, (c) chain affiliation, or (d) for-profit are more likely to adopt health IT than their counterparts.

External resources available to nursing homes will support facilities' incentives to invest in health IT adoption. In a competitive market, facilities share a limited patient resource pool, and survival depends more (than in less competitive environments) on how those resources are allocated across the competition. This suggests that the degree of competition in the local market may mitigate adoption of health IT. In markets in which competition among nursing homes is intensive, residents can vote with their feet. Facilities have to indicate to residents their ability to provide a high quality of care, and adopting health IT is an effective way to attract potential residents. Not adopting a new technology could result in a loss of residents.[33]

Hypothesis 4

Facilities located in competitive markets are more likely to adopt health IT.

Data Sources

This study uses 2 main data sources from 2005 to 2011. The first one is the OSCAR files, which is a repository of federally mandated onsite evaluations of all Medicare-/Medicaid-certified US nursing homes. The OSCAR files include operational, structural, and process characteristics, health inspections, and aggregate patient characteristics of each individual facility. This dataset is widely used in long-term care research studies. Another dataset is the Healthcare Information and Management Systems Society (HIMSS) Analytics Database, an annual study collecting information system data related to facilities' software and hardware inventory and reporting the current status of health IT implementation among more than 5300 health care providers nationwide. Many organizations are surveyed repeatedly over the years, which allows us to view panel data and use the fixed effects model.

The Institutional Review Board at the University of Massachusetts Amherst approved the study.

Data Analysis

Dependent Variables

The dependent variables are a series of dichotomous variables (0/1) indicating whether a nursing home adopted health IT. Following