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Clinical information technology in hospitals: A comparison between the state of Iowa and two provinces in Canada

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Summary Despite the growing interest in adopting information technology (IT) in healthcare, the degree of technology sophistication varies among healthcare organizations. Changes in the health care sector and continuous pressure to improve the quality of care have driven the evolution of IT in hospitals. This paper provides an overview of clinical IT sophistication in a sample of U.S. hospitals, and compares clinical IT capacities in this sample with a sample of Canadian hospitals.

The instrument used for the comparison measures three clinical dimensions of IT sophistication: functional sophistication, technological sophistication and integration level. Clinical areas that were considered include patient management, patient care activities and clinical support activities.

The comparison between hospitals in Iowa and Canada shows differences in clinical IT sophistication between the two settings. Hospitals in Iowa appear to have more technologies but fewer computerized processes and integration of patient management activities. Technological sophistication however, was low in both samples. Our findings confirm the construct validity of the measurement instrument and show initial evidence of its generalizability. More initiatives using the instrument would lead to enhancement in IT assessment tools that can be used for evaluation of IT in relation to patient management and quality outcomes.
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1. Introduction

It is only relatively recently that there has been a national call to overhaul healthcare information technology (HIT) in the U.S. Arising directly

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from the IOM reports, To Err Is Human (1999) and Crossing the Quality Chasm (2001) reports has been recognition that there is room for tremendous growth in the use of HIT to enhance patient care quality and safety. The arguments for significantly upgrading hospital's HIT infrastructure, while compelling, have not resulted in massive measures by third-party payers or employer groups to pay for desired HIT upgrades such as computerized provider order entry (CPOE) systems. A key challenge facing healthcare policy makers, payers and organizations is to decide how to best combine the limited existing HIT applications with new HIT applications and solutions. From both macro and micro systems perspectives there is an underlying need to understand what HIT applications are in place and to what extent they can be incorporated into the HIT systems that are needed. This paper describes one approach to capturing this baseline data, comparing data from U.S. and Canadian hospitals.

1.1. Background

Compared to other industry sectors such as banking and finance, the healthcare industry has suffered from slow information technology (IT) investment and acquisition, and thus has less developed IT applications [2,19]. Nevertheless, huge efforts have been carried out in the U.S. to fully computerize clinical and administrative records [2], with annual expenditures on IT reaching $14 billion [13]. Similar efforts have also been observed in Canada, with parallel advancement in telecommunication infrastructure, which support timely access to patients' information and communication between providers [12]. The changes in reimbursement and growth of prospective payment systems, the need for efficient management of resource utilization, and the increase in competitiveness have driven the evolution of IT in healthcare over the past decades [2,6,9,10,13,15].

Among the most important components of healthcare information systems are the functions that support clinical management of patients. A clinical information system (CIS) usually consists of a database and technologies that capture various aspects of clinical data in a timely manner, and support the evaluation of the process and outcomes of medical care, as well as the cost incurred in the delivery of services [8]. Thus, it requires the integration of financial and clinical data through systems operating on a broad range of hardware platforms [14]. The components of an integrated CIS include administrative data sources such as

enrolment files,[1] administrative files, birth certificates, death certificates and facility files plus clinical sources such as medical records, laboratory data, data on prescribed medications, radiologic data, and patient surveys regarding functional status [8]. A successfully integrated CIS is usually capable of supporting real-time comprehensive data collection with unique patient identifiers, which allows accurate analyses across different files, and comparison of quality and cost [8].

The growth of clinical information systems in acute and critical care environments has been observed in many clinical domains [7]. Nursing documentation and applications related to orders/results reporting from ancillary departments represented a category of early clinical information systems that were not multi-disciplinary in nature [7,15]. With the changes observed in the healthcare field in the 1980s (e.g., integration of care, change in reimbursement mechanism, focus on quality and health outcomes), new clinical systems surfaced, which involved multiple departments and sometimes complex technologies [7,15]. Examples include decision—support systems and computerized patients records [7,15]. The variety in CIS is an indication of their wide applicability in the healthcare field for connecting departments and units across a hospital [7], supporting patient care, enabling performance evaluation and improving efficiency and quality of work of health professionals [3].

The absence of a comprehensive measurement instrument that captures multiple aspects of clinical IT has been a significant barrier to investigating the impact of IT on the process and outcomes of care. To address this issue, Paré and Sicotte [12] developed a comprehensive instrument that characterizes and operationalizes clinical IT ''sophistication'' in hospital settings. The original paper by Paré and Sicotte [12] provides details on the instrument development and characteristics. Briefly, the instrument consists of three sets of items that assess different dimensions of clinical IT sophistication: ''functional sophistication'', ''technological sophistication'' and ''integration level'' [12]. *Functional sophistication* measures the extent to which processes are computerized in each clinical area. A list of processes is provided in each section of the instrument and the respondent is asked to check the processes that are computerized in the hospital or department in question. *Technological sophistication* refers to the extent to which various technologies are used in clinical

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[1] Include socio-demographic information (e.g., age, race, income) about individuals belonging to insurance plans [8].