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Healthcare professionals' adoption and use of a clinical information system (CIS) in primary care: Insights from the Da Vinci study

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ABSTRACT

Given the increasing prevalence of multimorbidity in primary care (PC), interdisciplinary PC teams supported by appropriate clinical information systems (CIS) are needed in order to deal with the complexity of multimorbid patients' care. Our team has developed such a system, called the Da Vinci system. However, despite the expected benefits, evidence suggests generally low rates of CIS adoption. To optimize adoption in PC settings, a better understanding of the implementation process of such systems is crucial.

Purpose: To identify user profiles, investigate the drivers of and barriers to adoption and use of the Da Vinci system, a PC tailored CIS, and understand the dynamics of the CIS adoption for each profile.

Methods: Using a longitudinal approach, we conducted a qualitative study (individual interviews, documentation and observation) based on the Diffusion of Innovation theory. It included 31 participants (primary care physicians, staff or residents, nurses, pharmacists) from two Family Medicine Groups in Quebec (Canada).

Results: The different user profiles drawn from the dynamics of implementation are linked to different sets of perceived drivers and barriers that evolve over time. Certain factors favour the decision of adopting Da Vinci early on: e.g. user skills and the system's expected ease of use and usefulness. Certain concerns hinder its adoption: e.g. perceived negative impact on the doctor–patient relationship.

Over time, 5 factors appear to be related to more advanced exploitation of the system's functionalities: user skills, ease of use, comfort using the system in front of patients, support from colleagues and, more importantly, perceived positive impacts.

Conclusions: A better understanding of the dynamics of CIS implementation provides insight into how best to encourage clinicians to adopt and make full use of such systems to improve the quality of care for multimorbid patients followed in PC settings.

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1. Introduction

Given the growing prevalence and incidence of chronic diseases [1–5], it has become increasingly difficult to ensure an optimal quality of care in primary care (PC) settings [6–9]. In order to satisfy this aim, the care provided by interdisciplinary healthcare teams needs the support of advanced clinical information systems (CIS) [10–12]. Unfortunately, there are numerous accounts of CIS implementation failure [13] where clinician user quotas are not met [14,15], particularly in small group practices [16]. In Quebec, adoption rates are especially low: only 21% of family physicians use electronic records to enter and retrieve clinical information, and a mere 8% use electronic reminders [17]. Therefore, research examining how clinicians adopt and use CISs is essential to the determination of factors related to its successful implementation.

The Da Vinci project comprises an innovative clinical approach supported by a CIS. It was designed locally by the Cité de la Santé interdisciplinary team (PC physicians, nurses and pharmacists), between 2004 and 2009, in order to deal with the complexity of comprehensive longitudinal care for multimorbid patients [18]. Electronic medical records (EMRs) are basically simple electronic transpositions of the paper chart and are thus reactive, doctor centered and content driven [19]. Da Vinci is more innovative: it is proactive, patient centered and task driven (Appendix I). It offers traditional EMR functionalities while giving PC team members access to timely, flexible, advanced features. These features include decision-support tools, patient-centered goal setting, and interdisciplinary functionalities which, through teamwork, aid in the continuity of care, achievement of common goals, and effective communication and coordination among team members as well as patients. More specifically, the Da Vinci system was designed around the CASE framework (C: Convince; A: Action; S: Support; E: Empower), inspired by the works of Prochaska and Di Clemente [20] on the readiness of patients to change their behaviour in ways that will help guide and coordinate PC teams' approaches to each of the patients'. These elements of value-added care-processes [19] are key, particularly with regard to the management of patients with chronic diseases who are typically seen by several providers [21].

To understand the dynamics of CIS implementation in PC, this study sought to (1) determine the profiles of different users, and (2) investigate drivers of and barriers to the adoption and use of DaVinci for each of these profiles.

A better understanding of these dynamics will provide insight into how best to encourage clinicians to adopt and use CISs to improve the quality of care for the complex patient populations followed in PC.

2. Methods

Given the study objective, we conducted a qualitative study with a longitudinal approach that focused on the *process* of the CIS implementation, adoption and use. This study was based on the *diffusion of innovations theory* [22].

Implementation of the Da Vinci CIS was carried out on a voluntary basis. Paper charts could be used by clinicians either exclusively or in combination with the electronic medical record (EMR), which was provided to the clinic free of charge. During our observation period, there was no official clinic policy mandating exclusive use of the Da Vinci CIS; adoption by interdisciplinary-team professionals was entirely voluntary. Two three-hour voluntary training sessions, approved by the local Continuing Professional Development Board, were offered to all potential users, including family medicine residents. Physicians received six study credits as well as the usual professional fees provided by the Régie de l'Assurance Maladie du Québec for "maintenance of competency" activities. Other professionals received their 6 h training during their normal work hours. Individual one-on-one coaching was also available on request.

2.1. Setting and sampling

Research was conducted in the two Quebec Family Medicine Groups (FMGs) where Da Vinci had been introduced. Regardless of their degree of Da Vinci use, all primary care physicians (PCP) – staff and residents – as well as all the nurses and pharmacists working there were invited to participate in a one-hour face-to-face interview (Table 1). Of the healthcare professionals contacted, 31 agreed to participate, including all Da Vinci non-users. They were compensated financially for their time. No difference in characteristics was found between non-participant and participants in terms of age or gender. The study was approved by the Research and Ethics Committee of the Centre de santé et des services sociaux de Laval (Canada).

2.2. Sources and collection of data

To support and broaden our understanding of the phenomenon being studied, we opted for a data-source-triangulation strategy [23,24] comprising: direct observation of clinical staff meetings and training sessions; documentation given to the users, including the minutes of meetings in which Da Vinci was discussed; and face-to-face interviews. However, the interviews were our main source of evidence. Data gathered from observation and documentation were used to substantiate, validate and complement the information obtained from the interviews. All interviews averaged about an hour in duration and were conducted by one of the researchers—a public health physician, who was not involved in the development or implementation of Da Vinci. At the end of the interview, each participant was administered a questionnaire in order to assess how frequently each of the various functions was used (employing a 5-point Likert scale ranging from "never" to "very often"). The interview guide is provided in Appendix II.

2.3. Theoretical framework

According to the *diffusion of innovations theory* [22], diffusion is the process by which an innovation is communicated over time through certain channels to the members of a social system. Here, the role of *change agents* – or opinion leaders – is