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A study of user requests regarding the fully electronic health record system at Seoul National University Bundang Hospital: Challenges for future electronic health record systems

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ABSTRACT

Objective: Although the adoption rates for Electronic Health Records (EHRs) are growing, significant opportunities for further advances in EHR system design remain. The goal of this study was to identify issues that should be considered in the design process for the successful development of future systems by analyzing end users' service requests gathered during a recent three-year period after a comprehensive EHR system was implemented at Seoul National University's Bundang Hospital in South Korea.

Methods: Data on 11,400 service requests from end users of the EHR system made from 2008 through 2010 were used in this study. The requests were categorized as program modification/development, data request, insurance-fee identification/generation, patient-record merging, or other. The authors further subcategorized the requests for program modification/development into the following nine areas of concern: (1) indicators and statistics, (2) patient safety and quality of care, (3) special task-oriented functionalities, (4) ease of use and user interface, (5) system speed, (6) interoperability and integration, (7) privacy and security, (8) customer service, and (9) miscellaneous. The system users were divided into four groups—direct care, care support, administrative/insurance, and general management—to identify each group's needs and concerns.

Results: The service requests for program modification/development, data request, insurance-fee identification/generation, patient-record merging, and other issues constituted approximately 49.2%, 33.9%, 11.4%, 4.0%, and 1.5% of the total data set, respectively. The number of data-request service requests grew over the three years studied. Different groups of users were found to have different concerns according to their activities and tasks. Within the program-modification/development category, end users were most frequently concerned with ease of use and user interface (38.1% of the total) and special task-oriented functionalities (29.3% of the total) in their use of the EHR system, with increasing numbers of requests in both categories over the three years. Users in the direct-care group differed from the other groups in that they most frequently submitted requests related to ease of use and user interface, followed by special functionalities, patient safety and quality care, and customer service, while users in other groups submitted requests concerning ease of use and user interface and special functionalities with a similarly high frequency.

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Conclusions: Users have continued to make suggestions about their needs and requirements, and the EHR system has evolved to optimize ease of use and special functionalities for particular groups of users and particular subspecialties. Based on our experiences and the lessons we have learned in the course of maintaining full-EHR systems, we suggest that the key goals to be considered for future EHR systems include innovative new user-interface technologies; special extended functions for each user group's specific task-oriented requirements; powerful, easy-to-use functions to support research; new flexible system architecture; and patient-directed functions.

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1. Introduction

A comprehensive electronic health record (EHR) system has the ability to integrate and streamline the healthcare delivery process, thereby improving the quality of care, increasing efficiency and reducing the cost of healthcare delivery, as well as to support research [1–3]. Although the adoption rates for EHRs are on the rise [4], rate for the use of comprehensive EHRs is still low worldwide. HIMSS Analytics [5], the authoritative source on EHR adoption trends, scored hospitals on their progress in completing 8 stages of adoption, from 0 for hospitals that do not have any EHR functionality installed through 7 for hospitals that have fully functional paperless EHR systems. As of December 2011, only 66 hospitals worldwide (approximately 1.1% of U.S. hospitals) had achieved level 7. Seoul National University's Bundang Hospital (SNUBH) in South Korea was the first stage-7 hospital outside the U.S.

SNUBH opened in May 2003 as a fully digital general hospital with an in-house integrated EHR system. It was the first hospital in South Korea to adopt a paperless EHR system. It currently has 910 beds and 23 operating rooms. There were 1,054,738 outpatient visits and 96,708 emergency-room visits in 2011. The hospital employs 1838 staff (including 218 professors of medicine, 324 physicians, 919 nurses, 76 administrative-staff members, and various other healthcare professionals). The current total IS operating budget is 12.6 million dollars.

After the EHR system was adopted at SNUBH, maintenance and enhancement were outsourced. Because the system's usability and its fit within the organizational culture and processes are significant factors in the successful implementation of EHRs [6], the SNUBH system has been continuously modified and updated since 2003 to meet the end users' ongoing demands, and by 2007, it had evolved into a complete EHR system that was interoperable and capable of advanced reporting. The ongoing process of maintaining and improving the system based on end users' requests has been one of the key factors in successfully encouraging end users to use it more effectively and allowing them to use it more easily. We have now begun to develop the next generation of our EHR system.

An EHR system cannot simply be used "out of the box" [7]. Different groups of users, such as physicians, nurses, other healthcare professionals, administrators, computer professionals, and patients, are involved in the multidisciplinary field of healthcare. Users carry out many complex and time-consuming activities that "complement" the system. Such complementary activities have been found to be critical in

generating benefits from new technology [7,8]. EHR systems should also be adjusted according to user feedback to effectively support the users' complex tasks.

EHR users have valuable first-hand knowledge of what EHR features and functionalities they need in their work environments that can be used in developing and improving EHR systems. Tracing and change management of the user needs provide the understanding needed to anticipate issues and ensure the continuous quality of systems [9]. One of the challenges in the development and planning of EHR systems is taking into account the needs and requirements of different users [10]. A review of studies on barriers to and facilitators of EHR systems [11] found that each group of users had a unique perspective on the implementation process that needed to be taken into account, though the study also highlighted important similarities between groups.

The present study categorized and empirically analyzed three years' worth of user requests from all different user groups that had been gathered in the process of maintaining a complete EHR system at SNUBH. Users can provide more concrete and specific requests regarding what features they are really looking for while they are using the system. Because there has been little study of user requests or needs after they have adopted EHR systems, we used our data to investigate how the EHR system has progressed and evolved through consistent user requests during routine use and which features different users have sought for the EHR system. The goal was to identify issues that should be considered in the design process and strategies for successful development of the next-generation EHR system.

2. Methods

Since implementing its EHR system in May 2003, SNUBH has been collecting service requests related to the system from users in all departments, including requests related to Electronic Medical Records (EMRs), Computerized Physician Order Entries (CPOEs), Clinical Decision Support (CDS), Electronic Medical Administration Records (EMARs), Administration/Claims, Laboratory, Pharmacy, Data Warehouse (DW), and Health Information Exchange (HIE). Requests were electronically submitted to the EHR operating team using a service-request application that included the name of the requesting department or subspecialty, a short title, the purpose of the request, and a detailed description. The user could choose one of the following categories to describe the purpose: program modification/development, data request, insurance-fee identification/generation, patient-record

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