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Clinical impact and value of workstation single sign-on

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ABSTRACT

Background: CHRISTUS Health began implementation of computer workstation single sign-on (SSO) in 2015. SSO technology utilizes a badge reader placed at each workstation where clinicians swipe or "tap" their identification badges.
Objective: To assess the impact of SSO implementation in reducing clinician time logging in to various clinical software programs, and in financial savings from migrating to a thin client that enabled replacement of traditional hard drive computer workstations.
Methods: Following implementation of SSO, a total of 65,202 logins were sampled systematically during a 7 day period among 2256 active clinical end users for time saved in 6 facilities when compared to pre-implementation. Dollar values were assigned to the time saved by 3 groups of clinical end users: physicians, nurses and ancillary service providers.
Results: The reduction of total clinician login time over the 7 day period showed a net gain of 168.3 h per week of clinician time – 28.1 h (2.3 shifts) per facility per week. Annualized, 1461.2 h of mixed physician and nursing time is liberated per facility per annum (121.8 shifts of 12 h per year). The annual dollar cost savings of this reduction of time expended logging in is $92,146 per hospital per annum and $1,658,745 per annum in the first phase implementation of 18 hospitals. Computer hardware equipment savings due to desktop virtualization increases annual savings to $2,333,745. Qualitative value contributions to clinician satisfaction, reduction in staff turnover, facilitation of adoption of EHR applications, and other benefits of SSO are discussed.
Conclusions: SSO had a positive impact on clinician efficiency and productivity in the 6 hospitals evaluated, and is an effective and cost-effective method to liberate clinician time from repetitive and time consuming logins to clinical software applications.

1. Introduction

Physician dissatisfaction with electronic health records (EHRs) in the Meaningful Use era has been significant [1–3]. For many physicians, EHRs and computerized provider order entry (CPOE) are among the largest, most dislocating changes in clinical practice and workflow in a generation. Physicians have expressed concerns over perceived usability, interruptions in clinical workflow and patient relationships, as well as the time added to an already heavy work volume. Superimposed on these challenges is the imperative for all care givers to maintain the highest possible security for protected health information through HIPAA compliance. It has been observed that what makes passwords effective – complexity and frequent change – also makes them hard to remember [4].

We estimate in our system that clinicians and physicians in particular were required to recall and periodically refresh from 8 to 20 or more passwords at the application level to access each, many requiring different user names and passwords. Other hospitals have stated their clinical users typically logged in to 8–10 or more applications [5,6]. Time lost by clinicians navigating, entering multiple passwords and resetting them when forgotten is valuable time that competes with and diverts from their care of patients. We regarded implementation of single sign-on (SSO) as a relatively rapid and easy way to help facilitate our clinicians' adoption and use of EHR technology, including CPOE and digital documentation.

SSO technology enables a clinician or care giver to login in usual fashion with a keyboard when first beginning work at the hospital and then streamlines all subsequent logins during that shift. SSO automates the login process, enabling clinicians to login only once to their desktop in order to gain expedited access to all their applications. It eliminates the clicks, key strokes and need for complex passwords that have become anathema to many clinicians. Because

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care givers are highly mobile and routinely pressed for time, there is great potential value in providing them roaming access to the information and systems they need at the point of care and as they move through the hospital.

Our enterprise objective in implementing SSO was to provide clinicians improved and expedited access to key clinical applications, and to eliminate password confusion and wasted time in password management, while enhancing HIPAA compliance in access authentication. Once logged in, clinicians need only tap or swipe their enabled identification proximity badge on card readers placed at all computer workstations (except those reserved for downtime access). No matter where clinicians may work within the hospital, use of a proximity badge to tap in and out (or "tap and go") enables them to pick up exactly where they left off and conveys rapid no click access to health records and other functionality as they change location. When the clinical user moves to another device in the facility, a simple tap on the badge reader brings the current state of the last computer used to the new screen.

SSO reduces repetitive, manual logins with automated processes, and expedites authenticated access to desired clinical software applications used by the clinician for the balance of a 12 h shift, after which login in the usual fashion must be repeated to enable another shift of accelerated logins. SSO provides support for all types of applications including terminal, client server and cloud-based applications. Our SSO platform has a simple graphical user interface (GUI) based tool for creating application SSO profiles. No coding is necessary, and we are able to profile and deploy new applications rapidly. Password administration enables automation of application password change processes, removing this task from the care provider. Providers can focus on patient care, not on continually managing new passwords to meet organizational password requirements. Clinical applications can be automatically launched, or closed, when a user signs in, depending on their location in the hospital. By automatically starting the required applications and signing providers in, more time is liberated for patient care, and clinicians spend less time navigating technology. SSO automatically locks workstations when care providers leave and re-authenticates them when they return to where they left off. This eliminates the need to manually lock sessions or use sometimes unreliable inactivity timers, and prevents loss of work in the system due to distraction or diversion. The process minimizes disruption to clinical workflows while meeting regulatory compliance and security requirements.

It was determined that the mostly highly effective implementation of SSO required a migration from workstation personal computers (PCs) to a thin client with processing occurring within the Cloud. In addition, we migrated from physical PCs to a virtual desktop infrastructure (VDI) in order to enable clinician roaming from service line to service line in the hospital using the new SSO access. During early implementation, 45 different clinical software applications were profiled and enabled for single sign-on.

Fontaine et al. reported previously in this journal that proximity card authentication significantly increased clinicians' perceived speed of login and decreased inappropriate shared login on clinical workstations [7]. Hope and Zhang evaluated perceptions of satisfaction with SSO in the emergency departments of a mid-sized integrated delivery network, finding that SSO increased clinical user satisfaction [8]. Heckle and Lutters sought to document the factors affecting SSO adoption using ethnographic research methods, and noted that SSO was not consistently effective or a good fit for collaborative work areas [9]. This report builds on past efforts to evaluate SSO technology by complementing these self-reported data and qualitative research methods with direct sampling of actual login times prior to and following implementation of SSO in 6 hospitals. We then quantified annualized and facility level clinician time savings and the associated financial value, using national reports of mean hourly wages of different clinical end users on the multidisciplinary care team who roam the hospital and would benefit from SSO. The objective of this study was thus to assess the impact of SSO implementation in reducing clinician time logging in to various clinical software programs, and in financial savings achieved by migrating to a thin client that enabled replacement of traditional hard drive computer workstations.

2. Methods

2.1. Study setting

We present a quantitative evaluation of the impact of the implementation of single sign-on login technology for access to computer workstations in 6 CHRISTUS Health hospitals. CHRISTUS Health is a mid-size independent delivery network in 6 U.S. states and 3 foreign markets with more than 350 services, 47 hospitals and over 15,000 physicians. CHRISTUS Health Information Management and Health Informatics began implementation of SSO across the enterprise in 2015. Initial implementation of SSO at CHRISTUS Health focused on enabling SSO among physicians, mid-levels and nurses. Subsequently, access was expanded to include ancillary services, such as respiratory therapists, dieticians, physical therapists, and other care providers who roam the hospital. Our electronic health record is MEDITECH Client Server Version 5.66 and our SSO product is OneSign Version 5.1 from Imprivata.

2.2. Study design

We share quantitative data on clinician time savings and recurrent computer hardware expenditure savings resulting from the implementation of SSO. Utilizing average national hourly wage rates, we translate the hours of time saved by various clinicians in reduced login activity into dollar cost savings produced when clinicians are liberated to be clinicians and care for patients.

The software utilized to implement SSO enables precise quantification of the number of logins by multidisciplinary care givers within each facility and across all 6 facilities on which analyses were completed. Our SSO product, OneSign Version 5.1 from Imprivata, and our virtualization software provided by Citrix, provide us with data-based reports on current and retrospective SSO utilization by clinicians including: number of deployed users; number of active users; number of logins; SSO application frequency of access profile; average logins per user; and average application events per user. While care giver satisfaction was not systematically surveyed, anecdotal reports of increased satisfaction among end user clinicians was captured and will be described.

2.3. Sampling techniques

We selected a 7 day observation period of SSO usage in May 2016 across 5 general community/general hospitals and 1 children's hospital in Texas and Louisiana. Measurements were completed of mean login duration to representative workstations pre-SSO and post-SSO implementation. Post-SSO involved 2 login durations: the first login of the day to the desktop (which required slightly more time than pre-SSO), and subsequent logins to the EHR utilizing the card reader or swipe technology (which required less time per login than pre-SSO).

2.4. Sample size

There were 65,202 logins to the enterprise EHR (MEDITECH Client Server 5.66) by clinicians in 6 facilities over a 7 day period post-SSO in May 2016 (also used to approximate pre-implementation logins). Potential SSO clinical users across the