An Analysis and Recommendations for Multidisciplinary Computerized Handoff Applications in Hospitals

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Abstract

In healthcare, patient handoffs are a common practice that is implemented by most clinicians who carry the responsibility of patient care. Ineffective handoffs have been associated with the occurrence of adverse clinical events. With the inception of the Joint Commissions’ National Patient Safety Goal (NSPG) 2E on handoff communication, computerized clinical handoff applications are emerging in hospitals. Computerized clinical handoff applications are intended to assist the clinicians in conducting effective handoffs by providing easy access to accurate clinical information and reducing the burden of handoff report upkeep. The purpose of this paper is to identify various types of computerized clinical handoff tools that are used in hospitals and perform a comparison of application characteristics, review clinical and business advantages and disadvantages in implementing computerized clinical handoff applications, and give recommendations for improvement.
Introduction

The growing number of adverse clinical events linked to miscommunication raised the concern of leaders at the Joint Commission (1). In 2006, the Joint Commission dedicated the National Patient Safety Goal (NSPG) 2 requirement E to effective handoffs stating, “…implement a standardized approach to “hand off” communications, including an opportunity to ask and respond to questions” (1). The Joint Commission also recommended improving effective communication by using clear terms in handoffs during all transitions of care and using information technology to ease access to clinical information in addition to standardizing clinical handoff processes (2).

This literature review was conducted to offer a three-fold benefit in clinical informatics: First, provide an overview of the properties of various types of computerized handoff applications in hospitals. Second, pinpoint the gaps in information system-facilitated patient care handoffs and provide recommendations to enhance system design to guide future development initiatives, and finally, identify some of the potential clinical and business values of computerized clinical handoff systems in healthcare.

Literature Review

To explore the types of computerized clinical handoff applications in hospitals, a literature review was conducted. MEDLINE(R) and CINAHL with full text by EBSCOhost 1950 to Present with Daily Update by Ovid SP bibliographic databases were accessed to retrieve pertinent articles needed for comparison. The key terms “electronic” and “computerized” served as base terms and they were combined with “handoff”, “hand-off”, “change of shift”, “to-do-list”, “sign off”, “sign out”, “handover”, “nurse to nurse handoff”, “nurse to physician handoff”
and “physician to physician handoff” terms for 19 unique searches were conducted in each
database for dates ranging from 1950 up to June 28, 2011. The searches were limited to journal
articles in English. Eligibility criteria included source data from a hospital setting and articles
reporting various handoff elements using an electronic system interface. These criteria yielded
405 articles, of which 19 met the criteria for review. From the 19 articles selected, reviewers
identified 16 unique applications. Three papers addressed the same application. The articles were
analyzed and organized using the following elements: system access alternatives, data entry
alternatives, and clinical and business perspectives.

System Access Alternatives

Authorized clinicians in hospitals access computerized clinical handoff applications in
one of three ways depending on whether the system is freestanding, electronic health record
(EHR) based, or mobile. A freestanding platform may be accessible via the internet (3-9).
Alternatively, a computer terminal houses the application (10-13). An EHR-based based
application requires the clinician to gain access from within the patient’s electronic chart, which
relieves the burden of having to separately locate the application (14-20). A mobile application
requires the clinician to access a personal digital assistant (PDA) or similar handheld device (21),
which helps to maximize the portability of clinical handoff information. However, when
clinicians do not have access to a handheld device, they opt for a desktop version (21).

Data Entry Alternatives

Most computerized clinical handoff applications are “integrated”, which means that the
application is hard coded to automatically pull predetermined patient information directly from
the patient’s EHR (4-20). However, manual data entry may also be available (3-5, 7, 8, 10-12,
This dichotomous data entry alternative lays the foundation for facing either an abundance or dearth of patient information. For automated data entry, the amount of information is highly dependent on its availability in the EHR (22). For manual data entry, similar variances exist since the clinicians have control over the amount of information they enter (19). One study found that the healthcare providers were unlikely to include their personal points of view regarding the plan of care because the actual handoff content is part of the patient’s EHR (19).

Some applications saved clinicians time in preparing handoff reports (4-6, 8, 11, 12, 17-19), regardless of data entry barriers or the continued practice of verifying the accuracy of the handoff information (11-13).

**Clinical and Business Perspectives**

Various clinician and business oriented advantages and disadvantages exist in implementing computerized handoff applications. Technology can streamline much of the perfunctory work in preparing handoffs (23). Healthcare providers positively perceive importing handoff information from different parts of the EHR (24), sorting patient lists by patient acuity (25) or pending and completed diagnostic tests (23), and prioritizing clinical tasks by time or significance (20). Technology can reduce the general risk for inadvertent clinical mistakes from occurring because the mental burden of staying up-to-date with all of the clinical activities that take place while on duty is alleviated (23, 26). However, a poorly designed application could lead to many clinician-oriented disadvantages. For instance, clinicians tend to develop workarounds (27), undermining application utility when handoff information in the EHR is not kept up-to-date (28). These flaws collectively could lead to underuse of several computerized clinical handoff applications (10, 27).

Business-oriented advantages and disadvantages can affect several organizational
operations. One business-oriented benefit of implementing computerized clinical handoff applications in hospitals is that it could increase hospital revenue in the long term. Computerized clinical handoff applications facilitate handoff communication within and across disciplines. It also decreases adverse clinical events (29), saves employee overtime by smoothing out the process of preparing and implementing handoffs (10), and decreases hospital length of stay (6). However, when the true gains from implementing an information technology-based application do not outweigh the costs of implementation and upkeep, having those applications in hospitals becomes too costly (30).

**Recommendations for Improving System Acceptance**

We present two alternatives for improving system functionality and design to facilitate system acceptance. Our recommendations are as follows:

First, creative approaches for improving the functionality of a computerized clinical handoff application should entail translating lessons learned from other clinical system upgrades. For instance, one author found it useful to offer virtual notes at various points in the clinical setting (31), and perhaps adding digital messages into certain sections within a computerized handoff application would be beneficial. Furthermore, adding safety logs into computerized handoffs could promote reporting of any clinical events that changed patient care outcomes (32). Integrating decision support software that notifies healthcare providers when a patient’s condition subtly deteriorates may trigger early intervention and prevent inpatient deaths (33). Task managers could discern strong or weak relationships between clinical tasks for a more explicit organization of clinical tasks and subtasks (20).

Second, changing the user interface design to bridge the gaps in multidisciplinary communication would be helpful. The likelihood of a computerized handoff application being
used as a vehicle for multidisciplinary communication improves the odds for winning the clinicians’ buy-in, and ultimately, it strengthens the chances for system acceptance. For that reason, an alternative to poor clinical handoffs due to incomplete information and miscommunication may be to incorporate prescribed medical and nursing care outcomes so that the clinicians can more easily monitor where patient needs exist and work together when preparing a discharge checklist. Multidisciplinary handoffs promote shared mind thinking (34). Stein et al. (2009) found advantages in organizing physician to-do-lists under “assess”, “order”, “communication”, and “perform” subtasks (p. 626-627). Even though assess and order subtasks were widely used by physicians (20), it is reasonable to presume that clinicians from different clinical domains carry out similar tasks and share similar types of patient care information during handoff communications. In a successive paper, Collins, Stein, Vawdrey, Stetson & Bakken (2011) conducted a systematic review of the literature and found that nearly half of the information during handoff communications by physicians and nurses were categorized under the same Continuity of Care Document (CCD) heading that was used to classify the clinicians’ handoff information. Thus, multidisciplinary clinical handoffs could promote a comprehensive clinical handoff.

**Conclusion**

Although a well-designed computerized clinical handoff application may be satisfactory in communicating clinical information in some settings, room for improvement still exists. Computerized clinical handoff applications are typically not designed with a multidisciplinary focus. Therefore, overall benefits of expanding the scope of clinical handoffs may enhance multidisciplinary communication.
## Table 1 Computerized Clinical Handoff Application Comparison

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<tr>
<th>Handoff Elements</th>
<th>References</th>
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<tr>
<td>Team Information</td>
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<tr>
<td>Demographics</td>
<td>3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19</td>
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<td>Diagnoses</td>
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<tr>
<td>Problem List</td>
<td>3,6,7,8,10,11,12,13,14,15,16,17,18,19</td>
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<tr>
<td>Reason for Visit</td>
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<tr>
<td>Allergies</td>
<td>3,7,8,10,11,12,13,14,15,16,18,19</td>
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<tr>
<td>Code Status</td>
<td>3,7,8,10,11,12,13,14,18,19</td>
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<tr>
<td>Medications</td>
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<tr>
<td>Diet</td>
<td>7,8,10,14,15</td>
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<tr>
<td>Laboratory Culture Results</td>
<td>3,4,5,7,8,10,14,15,17,19</td>
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<td>Study Results</td>
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<tr>
<td>Assessment</td>
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<td>Intake/Output</td>
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<td>Clinical Summaries</td>
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### Key:

- Nurse Practitioner Sign-out System 3
- MediSign (SignOut) 4, 5
- Patient Tracker 6
- UW Cores 7, 8
- EPSI: Electronic Patient Sign-out Information 9
- Change of Shift Report Template 10
- Patient Handoff Tool 11, 12
- PDTS: Patient Documentation Transfer System 13
- Rounding Report 14
- AISS: Automated Integrated Signout System 15
- Sigh out tool 16
- Cerner Signout Notes 17
- Computerized Signout Program 18
- SynopSIS (Sign-out Information Retrieval and Summary 19
- Signout Notes 20
- PDA: Personal Digital Assistant Signout 21
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