Determining Factors Relevant to Handoff by Role and Patient Population

Karol L. Fleming JD, MBA1, Nathan C. Gonzalez1, Ray McKelvy1, Robert L. Shapiro MD, MSCI2, William B. Webb BSPH, MBA1

1 MEDarchon, Inc. 301 Plus Park Boulevard, Suite 402, Nashville, TN 37217
2 Cardiovascular Division, Washington University in St. Louis School of Medicine, 660 S. Euclid Avenue, St. Louis, MO 63110

Background

Electronic medical records have increased the documentation of patient information by 30 to 50%. In order to augment oral handoff, an e-handoff tool must condense this data into only what is relevant. Unfortunately, the clinical literature provides an inconsistent view of the necessary data to be included (see Table 1). Therefore, this study sought to define the specific information needs of users, given their role and patient population.

Methods

Doctors and nurses with at least two years of clinical experience were selectively recruited given their role, specialty, and patient population. After informed consent, subjects were asked to name a clinical handoff. They were then presented with a number of factors identified from the clinical literature as potentially important to handoff and asked to classify the factors as items that should "Always," "Sometimes," or "Never" be included. Also, subjects were asked to describe circumstances that lead to including factors listed as "Sometimes," and list any factors not included. The responses were codified and summarized using descriptive statistics and the Z score. The kappa statistic was used to determine the agreement between whether a participant included a factor in their vignette and how they subsequently categorized that factor ("Always" vs. "Never") in the prompted exercise. Classification and Regression Tree modeling (Salford Systems) was used to determine whether a factor should be presented based on user attributes, patient attributes, and other variables gleaned from when to include variables classified as "Sometimes."*  

Analysis

In subgroup analysis, practitioners in the ICU were more likely to include urine output (p=0.06) and less likely to include patient condition (p=0.05). Medical physicians were more likely to include a patient picture (p=0.06) and less likely to include the unit admit date (p=0.07), or surgical procedures performed (p=0.03). Physicians were more likely to include patient condition (p=0.10) and less likely to include precautions (p=0.01), pain medication information (p=0.04), and urine output (p=0.03). Clinicians caring for pediatric patients were less likely to include patient condition (p=0.03) and room number (p=0.10).

Conclusion

This study suggests several new factors that are important for inclusion in an electronic handoff tool as well as the complexity of building such a tool. In order to optimize the user experience and use related hazards, an e-handoff tool must contemplate the user's role, specialty, patient population and the abnormality of data when deciding whether to display a certain factor.

References


Incorporation of Patient and Provider Attributes into an Electronic Medical Record Handoff Tool

Provider Type

Nurse
Medical
Surgical
Adult RN
Peds RN
Adult MD
Peds MD

Practice Focus

ICU
Medical
Surgical
Current care team
Recent clinical events
Discharge planning

Patient Type

Current patient
Previous patient
Other patient
Family
Current care team
Maternal gestational history
Recent clinical events
Discharge planning

Table 1. Literature Review

<table>
<thead>
<tr>
<th>Practice Focus</th>
<th>Ongoing Care</th>
<th>On-Hold Care</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU</td>
<td>61.1%</td>
<td>38.9%</td>
<td>100%</td>
</tr>
<tr>
<td>Medical</td>
<td>31.8%</td>
<td>68.2%</td>
<td>100%</td>
</tr>
<tr>
<td>Surgical</td>
<td>38.1%</td>
<td>61.9%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 1. Demographics

Figure 2. Oral Vignette Analysis

Figure 3. Intraobserver Agreement

Figure 4. Factor Subgroup Analysis

Figure 5. Sample CART Models

* "Sometimes" as defined in the study.
A Tale of Two Layouts: Vignette versus Structured Interview for Layout of an Electronic Handoff Tool

Karol L. Fleming JD, MBA1, Nathan C. Gonzalez1, Ray McKelvy1, Robert L. Shapiro MD, MSCI2, William B. Webb BSPH, MBA1

1 MEDarchon, Inc: 301 Plus Park Boulevard, Suite 402, Nashville, TN 37217
2 Cardiovascular Division, Washington University in St. Louis School of Medicine, 660 S. Euclid Avenue, St. Louis, MO 63110

Background
The benefits of an electronic handoff tool on patient care are known to be significant1 However, in a review of the clinical literature, we have found limited studies focusing on the usability of such a tool. Clinicians conceptualize patients differently, given their role and the care setting (i.e. inpatient vs. outpatient). Failing to account for these differences leads to poor usability, which may limit adoption and the associated gains of electronically supported handoff. The present study sought to define the proper layout (user experience) to support current practices.

Methods
Doctors and nurses with at least two years of clinical experience were selectively recruited, given their role, specialty, and patient population. After giving informed consent and completing a pre-study survey about their practice and handoff tendencies, subjects were asked to name a clinical handoff without disclosing PHI. Then, they were presented with a number of visualizations for handoff data and asked to arrange the factors on an imaginary computer screen. These responses were codified and summarized using descriptive statistics and the Z-score.

References

Two Dimensional Analysis
- Nurses were more likely to position labs (p=0.059), precautions (p=0.001), and risks (p=0.001) further to the left than physicians. They also positioned diagnoses (p=0.013) higher, but vitals (p=0.117), precautions (p=0.001), and next steps (p=0.011) lower than physicians.
- Participants based in the ICU tended to place diagnoses (p=0.158) higher on the Y-axis and precautions (p=0.057) risks (p=0.064) lower than their peers not based in the ICU.
- Participants focused on medical inpatients tended to place vitals (p=0.028), precautions (p=0.021), and risks (p=0.007) farther to the right, but vitals (p=0.008), pre-cautions (p=0.078), risks (p=0.057), and next steps (p=0.021) higher on the y-axis.
- Clinicians focused on surgical patients tended to place vitals (p=0.068), precautions (p=0.001), and next steps (p=0.088) farther to the left.
- Clinicians focused on pediatric patients tended to place diagnoses (p=0.010) and pending tests (p=0.032) farther to the left than those focusing on adults.

Conclusion
Our study demonstrates that the user experience for a handoff tool should be customized based on the user’s role (MD vs. RN), specialty/area of practice, and patient population (Adult vs. Pediatric). It also suggests the visual flow of information for these various roles, although this remains to be proven in an upcoming validation study.

Participant Demographics
- Sex: 50% Female, 50% Male
- Race: 75% Caucasian, 25% Latinx
- Provider Type: 50% Physicians, 40% Nurses, 10% Others
- Practice Focus: 30% Critical Care, 30% Surgical, 40% Medical
- Patient Type: 50% Adults, 50% Pediatric
- Years of Experience: 4.79 (Average), 3 (Median)
- Average Age: 30 (Range: 24 to 42)
- Predominantly Academic-Based (21 of 23 participants)

Order of Factors in Two Dimensional Layout
- Demographics
- Medical History
- Patient Status
- Interpretation and Care Planning
- Demographics
- Precautions
- Medications
- Pending Tests
- Precautions
- Risks
- Goals
- Next Steps
- Physical Findings

Legend
- Demographics
- Medical History
- Patient Status
- Interpretation and Care Planning
- Precautions
- Medications
- Pending Tests
- Precautions
- Risks
- Goals
- Next Steps
- Physical Findings

Two Dimensional Layout of Factor Categories
- All Participants (N=23)
- Nurse
- Physician
- Adult Patient Population
- Pediatric Patient Population
- Critical Care Focus
- Medical Focus
- Surgical Focus

Legend
- Demographics
- Diagnosis
- Precautions
- Medications
- Pending Tests
- Precautions
- Risks
- Goals
- Next Steps
- Physical Findings

Appearance of Factors in Oral Vignette
- Years of Experience: 4.79 (Average), 3 (Median)
- Average Age: 30 (Range: 24 to 42)
- Predominantly Academic-Based (21 of 23 participants)
Visualization of Laboratory, Vital, Precaution and Patient Status Data to Optimize Time on Task and Use Related Hazards

Karol L. Fleming JD, MBA1, Nathan C. Gonzalez1, Ray McKelvy1, Robert L. Shapiro MD, MSC1,2, William B. Webb BSPH, MBA1

1 MEDarchon, Inc. 301 Plus Park Boulevard, 8 Suite 402, Nashville, TN 37217
2 Cardiovascular Division, Washington University in St. Louis School of Medicine, 660 S. Euclid Avenue, St. Louis, MO 63110

Background

Electronic medical records have increased patient data capture by 30-50%. This has significant benefit for quality of care, but can also pose challenges as the amount of data can be overwhelming for clinicians. This is particularly true in patient handoff where multiple patients must be reviewed quickly. Negating use related hazards and reducing time on task through data visualization is therefore a significant factor for adoption of an e-handoff tool. Yet, three extensive reviews on visualization of data have found few studies, with most work focused on longitudinal data display. This study sought to test the time to comprehension, use related hazards, and user satisfaction associated with various methods of visualizing handoff data.

Methods

Doctors and nurses with at least two years of clinical experience were selectively recruited given clinical experience were selectively recruited given Predominantly Academic Based (21 of 23 participants) and Age: 24 to 42 (range: 24 to 42) Years of Experience: 4.79 (average); 3 (range: 2 to 5) Years of Experience: 4.79 (average); 3 (range: 2 to 5) was Predominantly Academic Based (21 of 23 participants)

Participant Demographics

<table>
<thead>
<tr>
<th>Sex</th>
<th>Race</th>
<th>Provider Type</th>
<th>Practice Focus</th>
<th>Patient Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.58</td>
<td>0.42</td>
<td>0.52</td>
<td>0.48</td>
<td>0.50</td>
</tr>
</tbody>
</table>


test the time to comprehension, use related hazards, and user satisfaction associated with various methods of visualizing handoff data. Descriptive statistics and the Z test were used to analyze data. Anecdotally, there did not seem to be a pattern between those participants who made errors and those who did not. Use related hazard rate for our study was low (3 errors out of 529 total observations), which is most likely due to the study environment and participant instructions (interviewer bias).

Table 1: Participants Demographics

<table>
<thead>
<tr>
<th>Years of Experience</th>
<th>Average: 4.79 (Average); 3 (Median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Average: 24 to 42 (Range: 24 to 42)</td>
</tr>
</tbody>
</table>

Time to Comprehension, Errors and User Preference for Graph Format

Control

Time to Comprehension, Errors and User Preference for "Graph-Plus" Format

Control

Time to Comprehension, Errors and User Preference for Lab Organization

Control

Time to Comprehension, Errors and User Preference for Precautions and Status

Control

Conclusions

This study has shown that the method of visualizing handoff-related data can reduce time to comprehension without negatively impacting use related hazards.

Analysis

When discussing preference, many participants stated that the colors used in trending graphs were somewhat unclear and that they preferred seeing actual numbers for the data values. Interestingly, the users spent more time reviewing these visualizations. This difference became particularly evident when reviewing multiple lab or vital values at the same time.

While participants preferred the icons for patient status and precautions, they indicated that numbers confusing surgical site infection, surgical site bleeding, pressure ulcers, and telemetry type. Also, stated was a request to show the number of team members or necessary for mechanical lift in certain instances of the ambulatory status icon.

References