The Effects of a Problem Oriented View on Clinician Workflow

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What might the attendee be able to do after being in your session?

Attendees of this session will be able to describe the importance of organizing and presenting clinical data using a Problem Oriented View. They will learn that implementing a Problem Oriented View into the electronic health record (EHR) increases the efficiency and accuracy of data retrieval by clinicians, improves usability, and decreases cognitive load. Finally, they will learn what material is already publically available to assist with the implementation of Problem Oriented Views at their home institutions.

Description of the Problem or Gap

The near ubiquity of the EHR[1] has made medical information more accessible than ever before. However, conventional EHRs still limit one's ability to quickly aggregate data into relevant details for a given medical problem or decision[2]. Clinicians are thus presented with a massive quantities of unfiltered data, and must exert significant cognitive work to decide which data points are meaningful, which contributes to clinician burnout[3,4]. There is great need for auto-summarization of data based on a patient's specific medical problems, and the Problem Oriented View meets this need.

Methods: What did you do to address the problem or gap?

The Problem Oriented View is driven by Problem Concept Maps, which leverage existing terminologies (SNOMED-CT, LOINC, and RxNorm) to specifically and reproducibly define a set of medical problems to which specific lab values and medications are linked. Expert consensus, achieved by a modified Delphi technique, are used to generate the linkages in Problem Concept Maps.

The Problem Oriented View we used exists within an EHR's Problem List, and gives details on demand about linked medications and labs, which are displayed underneath their respective problems. In order to assess the impact of this Problem Oriented View on clinical workflows, we performed a two-period crossover study in which internal medicine resident volunteers used both the standard EHR functionality (the control interface) and the Problem Oriented View (the intervention interface) to answer a series of data retrieval questions (e.g., "John has hypothyroidism, when was his TSH last checked?") using data from simulated patients. Participants were randomized into one of 8 groups, ensuring randomization of both which interface was used first and the order in which the questions were completed.

We measured the time needed for retrieval, the accuracy of retrieval, the usability of the interfaces (using the System Usability Scale, or SUS, survey), and the perceived cognitive load involved in using each interface (using the NASA Task Load Index, or NASA-TLX, survey). We hypothesized that the Problem Oriented View would be superior to the standard EHR functionality in all domains (speed, accuracy, usability, and cognitive load).

Results: What was the outcome(s) of what you did to address the problem or gap?

51 internal medicine residents from 3 institutions completed the study, 17 from each institution (UW-Madison, UT-Southwestern, and Brigham Health). The Problem Oriented View allowed for faster data retrieval, more accurate data retrieval (shown as a lower error response rate), had higher usability scores, and lower cognitive load scores. All scores were statistically significant (see Table 1). Note that the SUS has a scale ranging from 0 to 70, with 70 being the best experience, and that the NASA-TLX has a scale ranging from 0.4 to 2.8, with 2.8 being the highest cognitive load.

Table 1. Participant results for completion time, error rate, SUS scores, and NASA-TLX scores, differentiated by interface.

Metric	Problem Oriented View	Standard EHR Functionality	Difference	p-value
Completion Time	172.7 ± 44.2 sec	205.4 ± 74.1 sec	POV 32.7 sec faster	0.0002
Error Rate	3.4 ± 5.9%	7.7 ± 7.6%	POV 4.3% more accurate	0.0037
SUS Score	58.5 ± 7.9	41.3 ± 13.0	POV 17.2 points higher	< 0.0001
NASA-TLX Score	0.72 ± 0.26	0.99 ± 0.38	POV 0.27 points lower	< 0.0001

Discussion of Results

The outcomes of this study support our hypotheses: the Problem Oriented View performed better by every metric. This was true at every institution, and whether the Problem Oriented View was the first or second interface the participants encountered. Although the study was conducted using simulated patient data, the data retrieval questions were designed to reflect common clinical scenarios, so we have no reason to believe the results would not extend to live patient data. Auto-summarization provide by the Problem Oriented View therefore has the potential both to improve patient care (by facilitating more accurate data retrieval) and reduce clinician burnout (by providing answers more quickly, with a more usable interface that involves a lesser cognitive load).

Conclusion

The Problem Oriented View is a viable, standardized way to auto-summarize data that can be used at any institution. This study demonstrates that the use of a Problem Oriented View to auto-summarize data relevant to specific problems results in faster and more accurate data retrieval from the EHR, higher perceived usability, and lower perceived cognitive load by clinicians. Thus, the Problem Oriented View has the potential to improve patient care and address a root cause of clinician burnout.

Attendee's Take-away Tool

Attendees will be able to access all extant Problem Concept Maps content on http://problemlist.org, which will help them to advocate for the creation of Problem Oriented Views at their home institutions.

References

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