Visual Evidence: Increasing Usability of Systematic Reviews in Health Systems Guidelines Development

Connor J. Smith, B.S.; Rebecca Jungbauer, Dr.P.H.; Annette Totten, Ph.D.
Pacific Northwest Evidence-based Practice Center, Department of Medical Informatics and Clinical Epidemiology, OHSU, Portland, OR

Abstract

Integration of evidence from systematic reviews is an essential step in the development of clinical guidelines. Due to the complex nature of the content and presentation of some systematic reviews, committees tasked with developing evidence-based guidelines may struggle to take full advantage of the available data. Current practice for reporting is a static text report with a structure that is highly fixed and often impedes investigation of selected results or subgroups. Thus, there exists a need for an alternate report modality that facilitates the "slicing and dicing" of results to match different end-users' queries. We developed a dynamic visualization of data from a completed systematic review using the commercial product Tableau and assess its potential to permit customized inquiries. The use of interactive, accessible data may aid decision makers in developing evidence-based practice changes.

Objectives

The objective of this project was to assess existing software solutions and identify one that could be used to disseminate systematic review data in an interactive, accessible format. Our criteria were that the resulting report would need to contain data representative of the final report, an ability for end-users to customize the report for investigation of their own questions, and be accessible by a wide range of public users.

Materials and Methods

The data for this prototype are from a systematic review of nonpharmacological interventions for chronic pain.[1] The original report consisted of 300+ pages, 62 tables, 52 figures, 1066 appendix pages, and a 25-page summary. This data spanned 5 different types of pain, 8 categories of interventions, 6 possible outcome measurements, and included 202 studies. The data needed for the visualization was provided as a word document and PDF of the final report. The software chosen for this project was Tableau®,[2] a visual analytics platform used by many different industries, including public sector agencies and health systems. A one-year license for Tableau Creator was obtained to develop the report, which was posted to Tableau Public, a free service where designers may host their reports for others to use. Designers may also indicate whether or not they would like others to be able to download their workbook and/or data. Tableau relies on the use of a relational database structure. Data for the visualization was manually extracted as a subset from the final report for 4 types of pain, 240 study outcomes, and 74 summary outcomes. The data was stored in an Excel® document with 3 sheets using a relational structure, and then loaded into Tableau Desktop. Various types of visualizations were prototyped and evaluated for usability.

Results

Visualizations were developed to emulate forest plots, a common way to display quantitatively pooled data in systematic reviews. Individual visualizations for each study (Study Level) and for summary results across similar studies (Summary Level) were developed. The Studies Level visualization included data for six possible outcomes including three follow-up terms (Short, Intermediate, Long) for two outcome measures (Pain or Function). The summary level visualization included the summarized data by the factors used to group them in the original report. Outcomes were grouped across Condition, Intervention Category, Comparator, Outcome, and Term. These two visualizations were combined into an interactive dashboard. This dashboard allowed users to select factors they wish to view/hide, filtering the resulting data in the Summary and Studies sections. Additionally, selections made in the Summary section filtered the data in the Study section, allowing users to view the individual studies contained in a summary record. Tooltips for both Summary and Study data were displayed when hovering over data. Tooltips within the Studies Level included the participant numbers for both intervention and control, study quality, and publication information for the study, including a link to the PubMed abstract. The resulting workbook, including the dashboard and two sub-visualizations, was posted to Tableau Public.[3] The dashboard was created with an emphasis on flexible reporting. The original report separated treatments by the condition to answer prespecified key questions. When developing guidelines or investigating potential treatments, users may have an interest in comparing a treatment across

all of the types of pain, which is made impeded by the format. The dashboard allows for this comparison by using custom filtering of fields. For example, a user could easily compare the effectiveness of Pilates, a type of exercise, across chronic back pain and chronic neck pain. This functionality allows the user to quickly and efficiently investigate these questions in comparison to the traditional reporting format.

Members of previous and upcoming guidelines committees at Oregon Health & Science University (OHSU) were contacted to serve as key stakeholders for assessment of the resulting report. Individuals were shown a demonstration of the report on Tableau Public and were asked for their impression of its potential utility during guideline development. Feedback was positive, with individuals showing a particular interest in the "slice and dice" aspect of the report. A guided comparison was developed to demonstrate the intended use of the report. This uses the "Story" feature in Tableau to create semi-frozen views of worksheets/dashboards to convey information found using the tool in a narrative format. The resulting tab, Guided Comparisons, walks the user through how they could use the tool.

Discussion

Effective dissemination of evidence from systematic reviews is essential for the development of evidence-based guidelines and practice. Tools looking to accomplish this task must be intuitive and adaptable to allow users to investigate a number of inquiries and to be usable by people with different levels of expertise. We have developed a prototype report that holds promise for doing just that. Initial responses to this project have indicated interest in such solutions, citing their usability and diverse capabilities as strong advantages.

Next Steps/Continued Development

Development on this project is continuing in order to discover new methods of reporting and increase end-user satisfaction. With the common use of smart phones/tablets in learning health system environments, there is a need for tools developed to function with devices of varying layout/resolution. To account for this, additional views will be developed for use on smaller scale screens that will retain a comparable level of functionality. This also exists in Tableau and can be specified for a number of different viewing methods.

Conclusion

A need for innovative means for dissemination of evidence will continue to grow as more health systems invest in the development of evidence-based practices. The current reporting paradigm for systematic reviews is not conducive to dynamic, efficient consumption of evidence and will continue to require supplementation. Our project assessed the use of an existing reporting tool for this purpose and found that there exists a genuine value to exploring alternative reporting modalities.

Acknowledgements

References

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