AHRQ Webinar on Optimizing Data Visualization to Improve Care
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Optimizing Display of Blood Pressure Data To Support Clinical Decision Making

QUESTION: How do you try to distinguish which blood pressure (BP) measurements are obtained using science-based methods in accordance with the American College of Cardiology (ACC) and the American Heart Association (AHA) guidelines, associated AHA scientific statements, and efforts like the American Medical Association (AMA) and AHA Target BP and mean arterial pressure initiatives? Which BP measurements are likely to be the most accurate in terms of technique?

ANSWER: We designed open circle data points for "unvalidated" cuffs and filled-in circles for cuffs validated in the office. The operationalization of that education belongs to the clinical setting and how that cuff validation is entered so it can be represented in the visualization.

QUESTION: How did the patients enter the data exactly?

ANSWER: Patient's entered data in the EHR's patient portal and the portal data then flowed to the EHR. They entered the systolic number, diastolic number, date, and time. This could be burdensome for the patient if they had lots of data.

QUESTION: How did you get the user feedback? Did you present them various options and they selected what was best, or was there a standard usability Q&A approach? The challenge is often that people do not know what they want or need until you show it to them, so feedback may not yield best result if they don't have some idea of what is possible.

ANSWER: Quintessential usability design question! Our patient and clinician focus groups (we did 10 of them) each featured a series of designs with evolving choices to elicit preferences. We updated focus group images as we iterated and had new questions.

QUESTION: How would you recommend using this BP data to implement interventions and partner with patients to improve BP management? I realize that this is not yet available in patient portals. Have you gathered any patient perspectives?
ANSWER: We had patient perspectives { Koopman RJ, Canfield SM, Belden JL, Wegier P, Shaffer VA, Valentine KD, Jain A, Steege LM, Patil SJ, Popescu M, LeFevre ML. Home blood pressure data visualization for the management of hypertension: Designing for patient and physician information needs. BMC Medical Informatics and Decision Making 2020;20:195. https://doi.org/10.1186/s12911-020-01194-y} on how they might use it in 10 focus groups during development (5 with patients, 5 with clinicians). We are following up now with a more robust tool with the COACH [Collaboration Oriented Approach for Controlling High blood pressure] project, also funded by AHRQ (with David Dorr).

QUESTION: Wouldn't it be nice if we could develop display standards/best practices for these dashboards to improve usability for both patients and clinicians who will inevitably want to utilize multiple such tools across clinical conditions?
ANSWER: Absolutely! Multi-morbidity is where primary care clinicians live, and its complexity is a great target for data visualization that could help provide insights into interactions between individual conditions and their treatment. The Holy Grail to be sure!

QUESTION: When patients bring the data on paper, how is the BP data captured?

ANSWER: In practice, not very well; some people enter it in the EHR, some people don't! We know because we watched them!

QUESTION: Is the dashboard also accessible to patients outside the visit, like in the patient portal?

ANSWER: Not yet, but that is our current project. We are very excited for them to be able to use this tool on their own.

QUESTION: Digital interfaces like yours that are enabling shared decision-making interactions between clinicians and patients are now starting to fall into this FDA category of Software as a Medical Device (SaMD).

ANSWER: The big differentiator is risk - when the software does not "make medical decisions" but simply suggests that patients check with clinicians, we do not run into this much.

QUESTION: Any experience accommodating different types of patients during the design? Such as type A and very laid-back patients?

ANSWER: We are now examining the effect of "affective loading" on patient messages about blood pressure. You correctly point out that we must be mindful of all levels of potential patient anxiety. And its effect on blood pressure!

QUESTION: Were you able to have BUN [blood urea nitrogen lab test] to creatinine or potassium on the same graphs when, for example, initiating an ace?

ANSWER: No, there is a balance between including more information and the clarity of simplicity. But I will say that the medication timeline is really helpful in isolating whether medication caused a certain effect over time.

QUESTION: Congratulations on your hypertension visualizations. It has always been a dream of mine to create an informatics tool to help with my own care delivery. Did you work closely with programmers/EHR specialists to bring your tool to the EHR? From start to end, how long did it take to get the first version implemented in the EHR?

ANSWER: Started conceptualizing 2015, implemented 2018-2019, just in time for the pandemic! Patient portal entry screen implemented first, with porting of information to EHR data tables, and then visualization in the EHR.

QUESTION: is the home blood pressure machine compared with the clinic machine for variation in the values to come up with an adjustment factor for standardization? Is the patient educated on how to accurately and consistently take the BP?
ANSWER: That is part of the work of implementation. Not at the time of these studies, at least not any more than we usually do in practice.

QUESTION: Have you considered the application of accessibility options and/or baking in accessibility considerations a la Section 508? I work with potentially public facing medical data reports and use a specific set of colors designed to be viewed easily for those with different kinds of color blindness and also use certain guidelines to help those with low vision or the effects of dyslexia.
ANSWER: We chose our colors with color blindness in mind. We also assessed health literacy, numeracy, and graph literacy in our larger online study: https://pubmed.ncbi.nlm.nih.gov/35927964/.

QUESTION: How did you bridge the digital divide between patients with technology access vs. those that do not have access?

ANSWER: We are now designing for use in the patient portal, but ours is also shared during a provider visit. We need to meet both sides of the digital divide where they want to meet us, and that includes the patient portal as well as those that do not use the portal.

QUESTION: Are these dashboards designed to be used by both patients and physicians?
ANSWER: We started with use by physicians in the EHR, but are now implementing for patients in the portal.

Gabriela Schmajuk, M.D., M.S.
University of California, San Francisco
Incorporating PRO Data Into RA Clinical Encounters Using Health-IT (PACT)

QUESTION: How was the data used in the dashboard uploaded? For example, the dots for the joints, how was that created? AI? a python script?

ANSWER: Data used in the dashboard is entered during the clinical visit using smart data elements or via flowsheets. Patients fill out patient global and PROMIS physical function on paper, which is then entered via medical assistants (MAs) or via MyChart.

QUESTION: Why was Salesforce (private license) selected instead of open source (e.g. R has R Shiny)? Was it a problem integrating open-source with Epic, or did that not matter?
ANSWER: UCSF has a special license to Salesforce which minimizes its costs to us. I think it would be possible to integrate an open-source program with Epic if we needed to

QUESTION: Digital interfaces like yours that are enabling SDM interactions between clinicians and patients are now starting to fall into this FDA category of SaMD.
ANSWER: The flowchart on the FDA webpage may be helpful in determine if an application falls in the FDA category of SaMD https://www.fda.gov/medical-devices/software-medical-device-samd/your-clinical-decision-support-software-it-medical-device

QUESTION: Who do the patients contact if they have questions on the dashboard? Is it the doctor, MA, or IT?
ANSWER: The dashboard is used during the clinical visit - so questions are directed to the doctor. We are planning a last phase of our trial where we will start having MAs share the dashboard during the check in process. Patients can take a printout home, or have a screenshot sent to them via the patient portal, but do not have direct access to the "live" dashboard itself.

QUESTION: As a User Experience Designer in digital health, one of our greatest challenges has been gathering continuous user feedback from clinicians and patients. Do you have any suggestions as to how to encourage participation in this user research?

ANSWER: We have research coordinators with offices in the clinics. They provide "at the elbow" support to clinicians and form relationships with clinicians and patients such that getting feedback is easier.

QUESTION: How are you navigating the FDA CHDR [Center for Devices and Radiological Health] "Software as a Medical Device" regulatory efforts? https://www.fda.gov/medical-devices/digital-health-center-excellence/software-medical-device-samd
ANSWER: Great question - the dashboard displays data that is already collected during routine clinical care, so it's not considered a medical device.

QUESTION: How did you bridge the digital divide between patients with technology access vs. those that do not have access?

ANSWER: The dashboard is shared during the clinical visit. During in person visits it is shared on the clinic room computer screen; during telehealth visits the dashboard can be shared via a screenshare. Patients can take a print-out home with them (or get a screen shot via the patient portal) but do not access the live dashboard directly.

QUESTION: Are these dashboards designed to be used by both patients and physicians?

ANSWER: An RA dashboard is designed to be used by clinicians during the clinical visit, not for direct patient access.

Daniel C. Malone, B.S. Pharmacy, Ph.D., FAMCP
University of Utah
Enabling Shared Decision Making to Reduce Harm from Drug Interactions: An End-to-End Demonstration

QUESTION: Are there any plans to integrate your visual tool into electronic medical records to be used at the time of medication reconciliation review with the patient so that they can visually understand the drug-drug interactions and counter measures?

ANSWER: Not at the moment. Obviously, medication reconciliation would be a great time to evaluate DDIs, great idea.

QUESTION: Any plans or thoughts on using findings from your data collection or visualization to guide future research or develop clinical practice guidelines?

ANSWER: We haven't studied the topic of clinical practice guidelines and data visualization. Regarding future research, we need more studies to examine how best to provide medication safety information to both patients and providers in a usable format - beyond the tradition[al] "be careful." There is very little research in this area.

QUESTION: How often these dashboards are used by clinicians? 70%? or higher, or lower?

ANSWER: We haven't implemented our tool in production EHRs yet. That is the next step.

QUESTION: Based on your experience, is a range of minimal sample sizes needed to prepare for UI [User Interface] design or requirement analysis adequately?

ANSWER: Based on prior research conduct[ed] by faculty at the University of Utah, we estimated the required sample size to be 16 dyads to show differences between the groups. However, we found many significant differences with only 12 dyads. Recruiting was tough during COVID. I think 12 is probably the minimum I would consider for the type of research we are doing. If we could have obtained 16 to 20 dyads, I would have been much happier.