### Introduction  
  
  
  
Effective use of EHRs is recognized as a key element in achieving the Triple Aim—improving the patient experience of care (including quality and satisfaction), improving the health of populations and reducing the per capita cost of health care. Yet health care workers report unprecedented levels of burnout and dissatisfaction. This trend has prompted expansion of the Triple Aim to the Quadruple Aim [[1](http://www.annfammed.org/content/12/6/573.full)], which adds the goal of improving the work life of health care workers, both clinicians and non-clinicians, to the original three initiatives. EHR technology is cited as a major contributing factor to physician burnout [[2](http://www.rand.org/content/dam/rand/pubs/research\_reports/RR400/RR439/RAND\_RR439.pdf)]. Family Physicians have colloquially advocated for "Replacing the WHACK [-a-Mole implementation of EHR driven workflows] with the LAC [Life After Clinic]" as vision for what how improved EHR usability should reclaim time spent currently on after-hours documentation for the personal lives of clinicians.  
  
  
  
Here, usability challenges will be defined as product features or situations in which the design and implementation of EHRs do not align with the cognitive and/or workflow requirements and preferences of users within and across professional and patient roles and settings. This memo aims to describe the usability challenges that affect the clinician-patient relationship, which represent strategies by which the use of SHR can be promoted. This memo will aid in prioritizing key features of SHR development, which represent the tactics by which SHR will promote usability.  
  
### The structure of the broader problem of usability challenges  
  
  
  
Taking the above definition a a starting place, several interrelated domains emerge.  
  
- \_Product design versus implementation\_  
  
 Poor EHR design limits the potential for physician-patient engagement by interfering with face-to-face interaction with patients. Many local implementations of EHR products have been customized in an attempt to suit local needs, but the quality of these implementations varies greatly. EHR implementation is often viewed as a fixed cost, rather than an ongoing investment, requiring regular updates, training and iteration to function optimally.  
  
- \_Cognitive requirements versus workflow requirements\_  
  
 Current EHRs focus primarily on data collection rather than synthesis of data at the patient level. Current data synthesis methods are typically neither context nor patient specific. The lack of context awareness can lead to frequent clinical and administrative reminders that may force physicians to make hard stops, even for non-urgent matters, to address these issues. Features such as pop-up reminders, cumbersome menus and poor user interfaces interrupt workflow and increase cognitive demands by forcing users to "hunt" through the interface to retrieve data, record data, and trigger actions in the clinical workflow.   
  
- \_Best practices versus preferences\_  
  
 Physicians have not defined the clinical workflows health data products, such as EHRs, need to support. As a speciality that prides itself on individual excellence through purposeful effort and autonomous decision making, physicians may recoil to the notion that clinical workflows should be adapted to the needs of EHR systems.   
  
- \_Variation within professional roles\_  
  
 Few EHR systems are built to accommodate physicians’ practice patterns and work flows, which vary depending on size, specialty and setting. Within one practice setting, workers of the same professional designation may have different roles based on unique training, responsibilities or level of experience (e.g. resident physician vs attending physician, medical assistant versus master medical assistant).  
  
- \_Variation across professional roles\_  
  
 The scope of practice of non-physician health care professionals varies according to state licensure laws. Current technology often requires clinicians to enter data or perform tasks that other team members could be empowered to complete by preventing delegation of tasks as appropriate.  
  
- \_Variation across settings\_  
  
 Various characteristics external to an EHR system - e.g. architectural, staffing, patient population - can profoundly affect the successful implementation of an EHR within a given clinical setting.  
  
- \_Professionals versus patients\_  
  
 EHR design has been heavily influenced by the data capture and billing needs of clinicians, and external influences (e.g. meaningful use) not relevant to the clinician-patient encounter. Most EHR systems are not designed to support digital patient engagement. Failure to incorporate increased interoperability between EHR systems, mHealth platforms, and telehealth technologies represents a missed opportunity to promote health and wellness and manage chronic illnesses.  
  
### Not all usability challenges are directly related to EHR software design  
  
  
  
As noted above, a number of factors external to EHRs may have considerable effects on usability, such as:  
  
- sub-optimal implementation  
  
- risk management concerns  
  
- institutional liability concerns  
  
- regulatory requirements   
  
- inadequate training of users  
  
- suboptimal practice workflow processes   
  
### Not all clinician-patient interactions involve face-to-face encounters utilizing EHRs  
  
  
  
At least 7 types of physician-patient encounter are envisioned in the health care system of the near future. The majority of these encounter types do not require use of an EHR at the point of care, which allows the possibility that a light weight alternative application could service the health data requirements of the patient and clinician.  
  
  
  
| | \_Synchronous\_ | \_Asynchronous\_ |  
  
| --- | --- | --- |  
  
| \_EHR Necessary\_ | Face-to-face | EHR portal message |  
  
| \_EHR Optional\_ | Video chat, Telephone | Secure email, Secure SMS, App-based messaging |  
  
### Key usability challenges physicians face with current EHRs  
  
  
  
The American Medical Association identified key challenges physicians face with current EHRs [[3](https://www.aace.com/files/ehr-priorities.pdf)]. Of these, several deal directly with usability challenges within the clinician-patient interaction.  
  
- Interference with the patient visit  
  
- Issues with care coordination due to lack of interoperability  
  
- Increased cognitive workload for physicians  
  
- Lack of system-design support for team-based care  
  
- Communicating with patients in a changing digital landscape  
  
  
  
Other key usability challenges deal more directly with the design and implementation of specific EHR products.  
  
- Lack of data liquidity and high switching costs  
  
- Lack of product modularity to support unique physician practices and population needs  
  
- Insufficient support for incorporating end-user input into product design and post-implementation feedback for product improvement  
  
### Usability priorities  
  
  
  
Based on these challenges, the AMA recommends eight EHR usability priorities to be urgently addressed. Of these, half relate directly to the clinician-patient interaction.  
  
  
  
\*\*\_Not Directly Related to Clinician Patient Interaction\*\*\_  
  
3) Promote care coordination.  
  
4) Offer product modularity and configurability.  
  
6) Promote interoperability and data exchange.  
  
8) Expedite user input into product design and post-implementation feedback.  
  
  
  
\*\*\_Directly Related to Clinician Patient Interaction\*\*\_  
  
1) Enhance physicians’ ability to provide high-quality patient care   
  
- Promote effective communication and engagement between patients and physicians   
  
- Reconfigure EHR interface seamlessly into the practice   
  
- Rearrange electronic devices in the care setting to limit distractions. |  
  
  
  
2) Support team-based care  
  
- Allow physicians, or AI-agents, to dynamically allocate and delegate work to appropriate members of the care team as permitted by institutional policies. |  
  
  
  
5) Reduce cognitive work load  
  
- Manage information flow and adjust for context, environment and user preferences.   
  
- Balance use of unstructured narrative data, which many physicians find more succinct and reflective of the patient’s perspective and physician’s thought process, against the need for structured data to assist with computability |  
  
  
  
7) Facilitate digital and mobile patient engagement   
  
- Support synchronous and asynchronous communication with the clinical team   
  
- Support health promotion and management of chronic disease   
  
### Way Forward  
  
  
  
Based on the above findings, the following six projects are submitted for discussion. This is by no means intended to be an all inclusive of candidate projects that could demonstrate the potential for SHR to address usability challenges in the clinician-patient interaction.   
  
  
  
\*\*\_1) Natively support USPSTF Grade A and B and Choosing Wisely recommendations within the SHR\*\*\_  
  
The United States Preventive Services Task Force Grade A and B recommendations detail the preventive health services that uncontroversially apply to all patients [[4](https://www.uspreventiveservicestaskforce.org/Page/Name/uspstf-a-and-b-recommendations/)]. The Choosing Wisely campaign is a collaboration between all major medical societies. Its recommendations highlight over-utilized services that provide low value to patient care and the health system [[5](http://www.choosingwisely.org/clinician-lists/)]. Taken together, these recommendations represent much of the uncontroversial "what to do" and "what not to do" elements of care. Since a primary care physician managing an average patient panel size would need to spend 37 hours a week providing all Grade A and B recommended services, without any other clinical activities, automating as much of this process as possible could generate a rapid positive impact for primary care workflow [[6](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1447803/)].  
  
  
  
\*\*\_2) Reconfigure data entry to support relationship building, minimize distractions, and be more user-friendly for clinicians and patients\*\*\_  
  
The data liquidity achieved through implementation of SHR allows for an ecosystem of related services to assist clinicians and patients with documentation. A variety of startups demonstrate some various approaches. Bright.md markets a "virtual physicians assistant" that will take a history through a basic online interface and develop a basic treatment plan [[7](http://bright.md/)]. The documentation can then be reviewed and altered by the clinician. Tonic provides accessible, easy to use, web and mobile based questionnaires to assist patients with entering, reviewing and updating the data in their health records [[8](http://www.tonicforhealth.com/)]. Lexenco leverages UMLS Metathesaurus concepts based and an open-source NLP engine to provide SaaS processing of clinical content and association with UMLS concept IDs [[9](http://www.lexenco.com/)]. Each of these individual offerings represents a partial solution to important usability challenges listed above. Leveraging multiple third-party solutions, i.e. these or others, within a clinical environment highlights the "plug and play" modularity that SHR empowers, demonstrating short term benefit to clinicians and patients without lengthy development timelines of a bespoke, potentially duplicative technology.  
  
  
  
\*\*\_3) Support for differential diagnosis\*\*\_  
  
The differential diagnosis (DDx) is a ranking of the likely explanation for the presenting signs and symptoms of a given patient. A DDx is most often ranked by probability, although it may also be ranked by disease severity (i.e. prognosis) or ease of treatment (i.e. pragmatism). The discipline of compiling and reviewing a DDx underlies much of the expert thinking in medicine. Computer systems are adept at generating probability-weighted lists. An implementation of SHR could assist with compiling a DDx and integrating it within the clinical workflow, as a form of CDS. Technology developed by Inferscience is relevant to this objective [[10](http://www.inferscience.com/)].  
  
  
  
\*\*\_4) Solving the Usability Challenges of Non-Physician Health Care Workers\*\*\_  
  
This is included as a placeholder. Susan and I agree that this is very important; however it may be out of scope as a primary focus for Jay Schnitzer's request to address clinician-patient usability.  
  
  
  
\*\*\_5) Assessing and Addressing Social Determinants of Health within the Clinical Encounter\*\*\_  
  
Placeholder for now.   
  
  
  
\*\*\_6) SMS-based platform for asynchronous communication with the care team\*\*\_  
  
 Eva is an NLP-powered algorithm with access to the EHR and practice management software. She records her conversation with the patient within the EHR. Eva can report or collect structured data observations to or from the patient. When she does not know an answer, she triggers a medical assistant, triage nurse, or scheduler to call the patient, depending upon the issue. She can address most of the common reasons for calling the physician office, e.g. scheduling appointments, obtaining recent lab results, requesting updated referrals or medication refills, without a human-in-the-loop, and quickly trigger the appropriate human when necessary.