Scenario-based Requirements Engineering for Developing EHR Add-ons to Support CER in Patient Care Settings

Junfeng Gao, Solomon Berhe, Sunmoo Yoon, J Thomas Bigger, Adam Wilcox, Suzanne Bakken, Chunhua Weng, Columbia University, New York, NY
Research visit scheduling is complex and under-supported

- Multi-user constraint satisfaction problem;
- Complexities in research workflows, variations in local regulation policies, and diversity of clinical research settings.

Secondary use of clinical appointments from EHRs has the potential to reduce redundant tests and visits and to improve patient convenience and coordinator efficiency

- Need to understand the requirements.
Objective

- Our group has been developing electronic health records add-ons to support practice-based comparative effectiveness research.
- We present a scenario-based requirements engineering method to iteratively deepen requirements elicitation from clinical research staff who do not necessarily use the technical terms to express their user needs.
A participatory design team met twice a week to discuss the user requirements and software prototype designs, and developed use case scenarios.
Ten clinical research coordinators with different demographic characteristics and levels of experience from a variety of clinical research settings in a large academic medical were recruited to perform scenario-based software evaluation.
Methods 3/3

- **A structured interview** was conducted to assess user satisfaction and elicit unmet user needs after the software walkthrough.
  - Use case scenarios, think-aloud comments, survey sheets, and voice recording transcripts
- **Thematic analysis** was performed to analyze interview transcripts to discover themes regarding user needs for efficiently scheduling patient visits.
Results

Seven major themes were identified:

- **Alignment between research and clinical visits**
  e.g., “I (research coordinator) don’t want to schedule a research visit after sedation.”

- **Workflow flexibility support**
  e.g., “a research participant may see me (research coordinator) first before seeing a doctor.”

- **Data governance policies**
  e.g., “I (research coordinator) share my calendar with my co-workers.”

- **Constraints visualization and satisfaction**
  e.g., I need to cross check other calendars to make sure a research visit doesn't conflict with other appointments.

- **Interoperability with other systems**
  e.g., “Can your calendar system talk with practice management systems?”

- **Reminder for upcoming visits**
  e.g., “I (research coordinator) would like to reminded about incomplete procedures.

- **Privacy and regulatory compliance**
  e.g., “I (research coordinator) would like to use MRN to locate patient records in EHRs.”
Discussion

- Results identified common and diverging user opinions
  - Common user requirements were revealed from workflow interoperability to regulatory issues.
  - Diverse user needs were revealed, such as, "encrypting patient information".

- Results can guide the development of EHR add-ons to support clinical research in patient care settings.

- Limitation of this study
  - The user needs of community-based research coordinators needed to be explored
  - Multiple coders needed to determine the consistency in coding themes
Conclusion

A scenario-based software requirements engineering approach that combined participatory design and formative evaluations was effective for identifying user needs related to improving the efficiency of patient visit scheduling.
The research described was supported by grants R01LM009886 and R01LM010815 from the National Library of Medicine, grant UL1 RR024156 from the National Center for Research Resources, and an AHRQ grant R01 HS019853. We also thank all clinical research coordinators who participated in this study.