AHRQ National Web Conference on the Role of Health IT to Improve Medication Management

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Questions and Answers

QUESTION:
How does the reinforcement learning (RL) agent make decisions?

ANSWER:
Dr. Farris: The RL agent makes decisions based on a set of computations that are engineer-built. It's taking information about baseline characteristics of a patient – we ask them about their beliefs in treating their hypertension, the extent to which they think treating hypertension is necessary. their concern beliefs, etc. We ask these baseline items as well as other demographic information and we set the agent originally based on their responses. If a person said they didn't really need their anti-hypertension medication, or they were low on that item, we would send them a lot of necessity messages, then over time, the agent is learning what kind of message is working for an individual and that is based upon the set of computations and algorithms that fit within the agent.

QUESTION:
Do you have any preliminary results on the impact of the pillbox on patient care?

ANSWER:
Dr. Schnipper: We are just looking at the data right now. We certainly have some anecdotal stories of patients who were very effective users of the pillbox and found it incredibly helpful. The convenience of having the regimens mailed to their door and the reminders being there. Fewer stories about caregivers being part of the solution, which is not what I really wanted to hear. I wanted to hear that caregivers were now much more involved with care because they would get that text message, for example, that their loved one hadn't opened their pillbox on time. But, the final results are being analyzed as we speak. Some patients benefitted incredibly, but not all did. We really need to look at who are the patients who did benefit from this kind of an intervention. It's certainly not for everybody, but if we had a better idea we could target it much more efficiently. Stay tuned, we'll know more soon.

QUESTION:
If you had to do the pillbox study over, what would you do differently?

ANSWER:
Dr. Schnipper: Most of the studies I work on are considered low-risk studies from a human subjects standpoint, meaning we can have a non-clinician research assistant enroll the patients in the study. However, in hindsight, the logistics of pulling this study off are so embedded in how our healthcare system and hospital work that I wish we had had a clinician be the one to enroll patients in the study and then trigger all the subsequent actions that needed to happen. Both the inpatient team, and the hospital pharmacy team, because it does require a level of sophistication to anticipate what problems might occur and to prevent them from occurring. There are others, but this is probably the main one that I took away from this.

QUESTION:
Dr. Snyder - how do findings and recommendations vary by alert-type?

ANSWER:
Dr. Snyder: That is something that we're still looking in to. As I noted on the one slide, although all alert-types scored similarly as far as the numeric score and the modified I-MEDESA, we did see a slightly better score among the adherence alerts. On the slides where indicated the tables of our findings thus far, the situation where it would say most alert categories versus all, we did find the exception was for adherence alerts as well.

QUESTION:
The study was focused on community pharmacists as the end users, but pharmacists have varying levels of experience with medication therapy management (MTM) and are often supported by other users, such as pharmacy residents and students. Can you speak to this?

ANSWER:
Dr. Snyder: Yes, this is something that we noted in our prior AHRQ study that I mentioned – seeing the influence of the user-type and how they interfaced with CDS. You are correct, for this study we focused on community pharmacists, I think we had one pharmacy resident that participated. However, since we started this study we have worked to collect some additional data for a follow-up study where we interviewed both community pharmacists and community pharmacy residents and we're currently analyzing those data to better understand their information needs as they are completing a medication therapy review. So, we can think about how we might best design CDS to better meet the needs of different user types.

QUESTION:
Dr. Farris – is the pill bottle opening a good reward for the agent?

ANSWER:
Dr. Farris: That is an excellent question, and, in my opinion, it is not. It may be a good reward when there is true variability in adherence, but when adherence is as good as ours was, all the messages end up with the same usefulness because individuals are opening their pill bottle. So, a reward that is more clinical, for example the number of steps or if you can have the blood glucose for something in diabetes. We need to think about what those better rewards are for an agent in future work.

QUESTION:
Dr. Schnipper – can you talk more about the pros and cons of initialing this intervention at hospital discharge as opposed to stable ambulatory patients?

ANSWER:
Dr. Schnipper: From a logistical standpoint, there is no question that this is easier to implement in an ambulatory setting. You can wait until most of their prescriptions are going to be up for renewal, and therefore will not be denied by their insurance when it's time to refill them. You can pick a stable moment in time to set all of this in motion. You probably have a couple of days to set up the pill-box software program, fill the blister-packs so there is not a crazy rush, and then have it mailed to the patient's home. On the other hand, there is probably less immediate benefit. If we know that three days after discharge, half of the patients are taking the wrong regimen. And even if they know the regimen they are supposed to take, another half of them aren't taking it, there is such potential for benefit. The stakes are higher and it's much more complicated, but I think the benefits are also higher at the time of discharge. I think the question is, can we get

through these logistical problems to benefit patients more. We'll know more after analyzing the results of the study. If those logistical issues were so paramount that we couldn't see a lot of benefits in the transition setting, then I would say we should just go back to doing this in stable ambulatory patients. My guess is that in the real world, there will be both types of patients that we're going to want to initial this intervention. It's not for everybody, but in the right patient, you can do it in either setting given you are aware of the logistical issues.

QUESTION:
Do you know if the smart box data was able to be used in the emergency department to obtain trauma/unconscious type patients meds?

ANSWER:
Dr. Schnipper: Great questions. Picture a patient is unconscious, and you don't know what type of medication they have been on. If you can get access to this adherence report and say, "oh ok, this is what they are taking" and really taking, because it is linked to their pillbox, that would be valuable information for someone to know. Could they be taking something outside the pillbox? Absolutely. It may not be 100% complete, but it still would tell you a great deal of information. I think that is a great use case for this. As the internet of things explodes over time, we will know a lot more about patients, and we need to be careful about issues around cybersecurity. There are all kinds of use cases where we can see the benefit of this. This is a completely secure situation, as you can't hack in to a smart pillbox, but obviously there are always security concerns when sending things over the airwaves.

Additional Q&A Addressed Following the Webinar

QUESTION:
What cybersecurity precautions were applied to these technologies?

ANSWER:
Dr. Karen Farris: We used HIPAA-secure servers for the entire system and sent messages with no identifying information. In the future, a HIPAA text service would be used and would allow for greater individualizing of messages.

Dr. Jeffrey Schnipper: The pillbox meets HIPAA requirements for security. It should also be noted that protected health information is not transmitted by the device, or to the device.

QUESTION:
While adherence is important, I am interested in hearing from you all about the upstream use of technology for ensuring that patients receive the right medication, at the right time, in the right dose, taken as indicated, by the patients. Optimizing medication use. I am referring to use of technology for those patients on multiple medications from multiple prescribers as well at over-the-counter medications. I am interested in hearing of health IT capabilities and/or identification of health IT solutions in collaboration with pharmacists and physicians.

ANSWER:
Dr. Karen Farris: I am aware of Proteus sensors that know when a medication has been ingested. Also, there is significant interest in 3D printing of medications/combinations of medications, but this is sometime in the future. The engineering technology is available.

Dr. Jeffrey Schnipper: I agree that is crucial. That would need another intervention - smart pillboxes can only solve part of the general problem of medication safety.

Dr. Margie Snyder: I agree that this is important and warrants further research.

QUESTION:
Are there any studies which reveal which cohorts are most vulnerable to medication non-compliance, and shouldn't this knowledge precede any intervention design?

ANSWER:
Dr. Karen Farris: Importantly, an individual can be non-adherent to one of his/her medications and adherent to another one of his/her medications. Classifying individuals is limiting, as we truly need to consider the person-drug pair/dyad. We know that individuals who have concerns about the long-term effects of their medications are more likely to be non-adherent, but that can vary by medication.

Dr. Jeffrey Schnipper: There is a robust literature on which patients are most vulnerable to non-adherence. We chose to be broad in our enrollment criteria because we wanted to know which patients would use this intervention most effectively and would benefit the most from it. In the future, interventions like this could be more targeted, based on this information.

QUESTION: Are any of you familiar with the use of clinical decision support (CDS) upstream to first evaluate appropriate use of medications as a means of optimizing medication use before adherence?

ANSWER:
Dr. Karen Farris: Yes. The medication for the treatment of hypertension was used in this intervention. CDS has help but it also has limitations because of incomplete or competing medication lists.

Dr. Jeffrey Schnipper: I agree that medication regimen optimization is incredibly important for patient safety. I usually see this task as under the domain of trained pharmacists. I am not personally aware of CDS to assist with this process, but it could exist (e.g., identify medical problems without medications, or vice-versa, identify best-practice medications for particular problems, etc.). Dr. Gordon Schiff is doing research on problem-based prescribing, developing electronic applications to implement this process.

Dr. Margie Snyder: Yes, various CDS exist in the context of medication therapy management (MTM). Some CDS encourage an evaluation of appropriateness whereas others focus on evaluating adherence.

QUESTION:
Did anything surprise you about your findings?

ANSWER:
Dr. Karen Farris: I was surprised how adherent individuals were, given the proportion of days covered (PDC) data that we had from the payer. In our calculations, the adherence was not as poor as first considered.

Dr. Jeffrey Schnipper: 1. How difficult the intervention was logistically. 2. How many patients declined to participate due to issues of shame, guilt, or denial.

Dr. Margie Snyder: We were somewhat surprised to identify two use cases for pharmacist-CDS interactions (i.e., both before and after patient appointments.) However, in thinking more, we realized this aligned with prior observations of pharmacists refraining from "working up" MTM cases to promote efficiency.

QUESTION:
Are you aware of how well electronic health information exchanges (HIEs) can improve the accuracy of patient medication lists and how this can help evaluate adherence in a physician office?

ANSWER:
Dr. Karen Farris: HIE medication lists will still be different (most likely) from what the patient has at home, what is included on discharge lists, what is included in the physician office medication list, and what is dispensed in a pharmacy. Better technology/algorithms will be needed to develop an integrated medication list that will require input from patients as well.

Dr. Jeffrey Schnipper: This is still a work in progress. It's feasible to bring in medication information from many electronic sources. However, there still needs to be a manual step where a trained medication history-taker reviews this information with the patient/caregiver and produces a "best-possible medication history." Then, pharmacy refill information can be used to help evaluate adherence. Until/unless we have a "central source of truth" for medication information, HIE can only get us so far.

Dr. Margie Snyder: This is an important point and I am currently collaborating with a study team who is studying the use of HIEs for medication reconciliation.

QUESTION:
Do you have any guesses as to which traits you can use to find those who are interested in this type of reminder to apply to larger populations?

ANSWER:
Dr. Karen Farris: Early adopters and text users are all that I would hypothesize about at this time.

QUESTION:
Do you think that this can be extrapolated to any type of message (text/call) since we don't have an agent to deploy for this in our live patient work?

ANSWER:
Dr. Karen Farris: No, the messages were changed via the agent and this approach could not be replicated without such technology. I would be happy to talk with you if your company has interest in testing this technology in the field. That would be tremendous!

QUESTION:
From your baseline demographics, it appeared that very few patients had an income less than $50,000. What are your suggestions to account for non-adherence due to the inability to afford co-pays or living on a fixed income, such as those on social security?

ANSWER:
Dr. Karen Farris: In this study, we recruited individuals who had access to medications. You are correct in pointing out that a messaging approach to improving adherence is limited to those who have medications available.

QUESTION:
From Dr. Karen Farris' presentation, for the colorful chart that shows "Monthly Pill Bottle Openings, Control vs Messaging, Month 1 - Month 6": please could you send me the journal reference if it has been published?

ANSWER:
Dr. Karen Farris: We are now working on the publication.

QUESTION:
For the RL Agent study - what are some of the reason that caused medication concerns to rise $ from 12% before the study to 20% after?

ANSWER:
Dr. Karen Farris: We were sending messages that they should contact his/her physician or $ pharmacist if a particular side-effect was occurring. In my view, this served as a mechanism to $ raise concerns.

QUESTION:
Was there any attempt to match the language/verbiage of the alerts to the style and preferences $ of the patient – such as cultural preferences, age, formal vs. relaxed, etc.?

ANSWER:
Dr. Karen Farris: No, during this early work, we did not tailor text messages to the extent that you are asking. We used only full sentences.

QUESTION:
What is the possibility of having an additional reward for the "environment"? For example, discount on future meds for those patients who are 90% or higher to encourage consistent medication adherence?

ANSWER:
Dr. Karen Farris: The reward is for the agent, not the patient. In this intervention system, the reward was whether the pill bottle was opened or not in response to a text message that was sent. The reward in this instance is not for the patient.

QUESTION:
How patient behavior is evaluated and approached when patients do not adhere to prescribed medication(s) due to side effects which impact negatively their well-being /condition? Do any study results on this topic is known?

ANSWER:
Dr. Karen Farris: When patients express concerns about medications, a motivational interviewing (MI) approach is likely necessary to fully understand the concerns. MI is an effective technique in goal-setting and adherence behavior. Also, there are various surveys that may ask patients about his/her confidence to manage side effects, e.g., oral chemotherapy, and to provide information about how to manage such side effects.

QUESTION:
For the Smart Pillbox study, are there pharmacists on the unit, or only in the main pharmacy?

ANSWER:
Dr. Jeffrey Schnipper: Some of our hospital units have unit-based pharmacists who round with the team, while others do not. In all cases, there is a pharmacist assigned to review orders for patients on each unit. As part of the intervention, we engaged with these pharmacists on occasion, but most of the interaction was with the pharmacists who worked in our outpatient pharmacy, who are centralized there.

QUESTION:

How is data captured in the Smart Pillbox if a patient removes the entire day's meds needed at once rather than prior to use?

ANSWER:
Dr. Jeffrey Schnipper: The pillbox would just detect that the pill had been taken early.

QUESTION:
Margie and Jeff - I see that you collaborated with practice-based research networks (PBRNs). Do you have any tips for others about working with PBRNs for these types of studies?

ANSWER:
Dr. Jeffrey Schnipper: Contact them as early in the process as possible (including grant writing and study development). They may have experience with similar interventions, will have insight into the differences among practices, and may be able to assist with buy-in from PCPs. (Special thanks to Harry Reyes, the study's project manager and who also helps run the BWH PBRN, for this answer).

Dr. Margie Snyder: I would suggest reaching out to the PBRN(s) as early as possible so the clinicians can provide feedback on the relevance of the project to their practice and feasibility of the study design. It is also important to budget in enough staff support and travel in order to meet with practices located across a state, region, etc. for study training. In addition, engaging early on with your IRB is helpful as clinicians might have multiple roles on a study (human subject AND non-key personnel assisting with data collection.)

QUESTION:
For presentation 2: Since medications with multiple changes (warfarin) or PRN dosing are excluded, could technology in this context make medication management more complex for patients being one more thing to track? Only prescription adherence for included medications was measured - not others.

ANSWER:
Dr. Jeffrey Schnipper: You are right - it could make things more complicated. Some patients would leave their other meds next to the pillbox, and that often worked well. For the study, we tracked adherence for all meds in the regimen, regardless of whether it was in the pillbox.

QUESTION:
Any preliminary data to show efficacy of the intervention? Is the smart pillbox available in the market or for researchers? How many pills can each compartment in the smart pillbox hold)?

ANSWER:
Dr. Jeffrey Schnipper: Only anecdotal data so far - results are being analyzed as we speak. Right now, the pillbox is being offered to health plans or hospital systems. But they are working on direct marketing to patients (and their caregivers). Each well can hold about 10 meds, but it obviously depends on the size of the pills. If a patient takes meds fewer than four times per day, then they can use two wells per time period if needed.

QUESTION:
Thinking about the data, were there any patterns seen in terms of types of medication and adherence? (I missed the first part of the presentation, but this may have been addressed).

ANSWER:
Dr. Jeffrey Schnipper: That's a great question - we are analyzing the data as we speak. In the

intervention arm, we can do some sophisticated analyses of adherence patterns.

QUESTION:
Do you think using transplant patients be better for the pillbox study? They usually will have more than 5 medications and as transplant patients their recovery time is longer, so more time would be gained to set up the pillbox.

ANSWER:
Dr. Jeffrey Schnipper: Yes, I think they would be excellent candidates. In our hospital, they also have dedicated pharmacists, who could help implement the intervention.

QUESTION:
How long was the "meds to beds" program in place at the hospitals studied with the pillbox?

ANSWER:
Dr. Jeffrey Schnipper: We have had a meds to beds program for at least 10 years, but only with a limited number of patients (e.g., advanced heart failure). It was new to general medicine for this study.

QUESTION:
In presentation #2, I know you pointed out the "turnaround time" in your presentation for getting patients medications to patient prior to discharge. Did you experience delays in discharge due to this? I know there can be medications that are not reconciled.

ANSWER:
Dr. Jeffrey Schnipper: We probably did delay time of discharge (but not the date of discharge) in a few patients. We will evaluate length of stay (by the minute) in our evaluations, still pending.

QUESTION:
Until the very end of the patient's admission. So, this last-minute change can then delay everything. Your thoughts?

ANSWER:
Dr. Jeffrey Schnipper: Regarding last-minute changes to discharge regimens, yes this can cause delays. The key lessons learned were to proactively communicate the possibility of last-minute changes so that the outpatient pharmacy could be prepared. But of course, some last-minute changes are completely unexpected.

QUESTION:
How patients' behavior is evaluated and approached when patients do not adhere to prescribed medication/s due to side effects which impact negatively their well-being /condition? Do any study results on this topic is known?

ANSWER:
Dr. Jeffrey Schnipper: There is a literature on this topic. In my research, once we ask about adherence in a non-judgmental way, we then go right into the possible reasons, including side-effects, not being able to afford them, etc. We then create an individualized care plan with appropriate actions to take.

Dr. Margie Snyder: Intentional non-adherence due to side effects is certainly important and warrants further research.