PREVENTING ERRORS AND PROMOTING SAFETY THROUGH BETTER MEDICATION MANAGEMENT

COLLIN: Welcome to the AHRQ webcast. This is the National Web-Based Teleconference on Health IT: Preventing Errors and Promoting Safety Through Better Medication Management.

At this point, I'd like to introduce today's moderator, Angela Lavanderos, who's a program analyst with the health IT portfolio at the Agency for Healthcare Research and Quality.

Angela, the floor is all yours.

MODERATOR: Thank you, Collin.

Before we begin today's session, we are required to read the following statement for continuing medical education purposes: "This educational activity has been approved by the Wisconsin Medical Society for 1.5 AMA PRA Category 1 credits. Speakers and planners are required to make disclosure of any relevant financial relationships which may be related to the subject matter discussed. Speakers and planners for this educational activity have made proper disclosure and have no relevant financial relationships that exist now or in the past 12 months."

I am now going to introduce the four speakers that we have for today's national teleconference.

We have Dr. Donna Horn, who's the director of patient safety at the Institute for Safe Medical Practices in Community and Ambulatory Practice. She has over 25 years of experience in the retail chain community pharmacy practice setting, most recently serving as the privacy officer and manager of regulatory affairs for Brooks Eckerd Pharmacy where she wrote numerous policies and procedures to govern pharmacists working in chain pharmacy. Prior to joining ISMP, she served as president and chairman of the National Association of Boards of Pharmacy, focused on patient safety, primarily on reducing medication errors in community pharmacy. Dr. Horn also served 11 years on the Massachusetts Board of Registration and Pharmacy as both a member and as president.

Our second speaker is Dr. Andrea Wessel. She's an associate professor at the Medical University of South Carolina and a practice partner of research network investigator, better known as PPRN. PPRNet is a primary care practice-based research network among users of a common electronic health record whose membership includes 180 practices in 42 states. Dr. Wessel served as a co-investigator of the medication safety and primary care practice, translating research into practice projects in 20 PPRNet practices from 2007 to 2010. The project aimed to develop a set of prescribing and monitoring indicators relevant to primary care to disseminate audit and feedback reports on the indicator set and to evaluate the impact of a medication safety-focused, quality improvement intervention in participating states.

Our third speaker is Dr. Chris Lehmann, an associate professor of pediatrics. He's a board-certified neonatologist at Johns Hopkins University School of Medicine. He currently holds joint appointments in the divisions of health sciences informatics and dermatology at the school of medicine. He is the editor-in-chief of the Applied Clinical Informatics Journal. Dr. Lehmann served as the principle investigator on a two-year AHRQ grant entitled Medication Monitoring for Vulnerable Populations via IT and as one of the editors of the textbook Pediatrics Informatics. Dr. Lehmann served as the secretary on the board of directors of the American Medical Informatics Association and served, in the past, on the executive committee of the Council on Clinical Information Technology of the American Academy of Pediatrics. He is the director for clinical information technology at the Johns Hopkins Children's Center and the founding director of the Child Health Informatics Center at the American Academy of Pediatrics.

Our final speaker will be Miss Judy Smetzer, the vice president at the Institute for Safe Medication Practices. Prior to joining ISMP, Miss Smetzer served as associate vice president at St. Luke's Quakertown Hospital in Quakertown, PA. During her 30-year career, Miss Smetzer has advanced from a staff nurse to various management positions, increasingly focusing on quality improvement and risk management. She has served as a risk management consultant for long-term and community-based healthcare organizations, published many articles on medication error prevention in peer-reviewed journals, and is a contributing author of the handbook "Mosby's Nursing PDQ for Medication Safety." Miss Smetzer served as an author and editor of ISMP's four newsletters for acute care providers, nurses, ambulatory, and community care providers and consumers. She also is an adjunct assistant professor at Temple University's School of Pharmacy, teaching a course on medication error surveillance and control planning. She received her BSN from Cedar Crest College.

Dr. Horn will begin the teleconference by providing an overview of important issues related to error reduction in the field of medication management.

So Dr. Horn, I now turn it over to you.

DR. DONNA HORN: Thank you, Angela.

It's a pleasure for ISMP to actually introduce this subject because our mission at ISMP is to advance the patient safety worldwide by empowering healthcare community, including consumers, to prevent medication errors.

I'd like to start with definitions of what medication errors are. I think, intuitively, we all know that a medication error is when the patient gets the wrong drug. Either the drug was not intended for them or there was something incorrect about the prescribing, the administration, or the dispensing of the medication.

We also want to talk about adverse drug events and that's when there's injury from drug therapy. One of the things that it's important to understand from the site that we read, that at least 25 percent of adverse drug events are preventable. And that's a good thing because they're among the most common cause of harm during a patient's care.

But just how bad is the scope and significance of medication errors? Let's take a look.

Well, if we look at the inpatient setting, we've done some research and some studies on looking at what kinds of errors are occurring in patients and you can see that there's a wide variety; anywhere from 3.7 to 84.1 per 1,000 admissions has been reported as prescription errors inpatient.

Now we have preparation and dispensing errors, meaning that the patient got the wrong medication. We also have drug administration errors. And you can see that all that combined can lead to about – other research showing four percent of all hospital admissions will result in a patient having an adverse drug event which is preventable. So that's why we're here today.

We also want to look at the scope and significance in the outpatient, in the community pharmacies. Studies have shown anywhere from 1.7 to 24 percent dispensing error rate in community pharmacies. So even if we take the lowest error rate of 1.7, we see that there could be four errors per every 250 prescriptions filled. That means 60 million preventable adverse drug events every year, meaning that five percent of the ambulatory patients will experience a preventable adverse drug event with the dosing errors being the highest in clinical significance.

This is important because when a patient has a dosing error and they end up in the hospital, it ends up costing healthcare money. As you can see from one of the studies, $121.5 billion in hospital admissions is a result of drug-related problems.

We've also done some research in other ambulatory settings. You can see that in outpatient pediatric clinics, studies have shown that there's 15 percent of wrong dosing prescribing errors for the most common 22 drugs used in pediatrics. Other studies show in ambulatory clinics – we researched those and our data shows 21 percent prescribing errors. And what's staggering is that in hemodialysis units, the study has shown that 97.7 percent of patients are subject to prescribing errors.

So this leads us to understand that the patients who are at the highest risk for experiencing a preventable adverse drug event are: people who are on multiple medications, because of the contraindications and the drug interactions; people with low health literacy, because of the fact that they have maybe difficulty understanding the directions and understanding how to administer their own medication; elderly patients who are both on a lot of medications who also may have some low health literacy issues and also have some issues with seeing and dexterity, so they have trouble taking their medications correctly; we saw with the hemodialysis study, that patients with renal or even patients with liver impairment are at a higher risk for preventable adverse drug events because of the fact that drugs interfere with each other or interact with each other; and then pediatrics because of the dosing issues that we see.

At ISMP, we've coined a phrase called high-alert medications. And we've had a high-alert list available to acute care for a number of years now but just recently, through our research, we were able to come up with an ambulatory list. So these are the medications that we consider high-alert in the community setting. And high-alert means that they can cause more harm than other medications when they're either prescribed, dispensed, administered or given to the patient

incorrectly. They carry a significant risk of causing serious injuries or even death if a patient misuses these drugs. So these are the medications that we have concentrated on our research.

At ISMP, we've seen that there's different ways and different strategies to use to prevent medication errors. We have a list of strategies based on how well they perform. The items at the top of the list improve the system reliability. The items at the bottom of the list improve human reliability. And we need to have both in conjunction in order to have effective error-reduction strategies because just improving humans alone is not going to prevent medication errors. Telling them to get more education or to review policies and procedures isn't going to be the way to reduce medication errors. So we want to have a combination where he have actually some forcing functions or some actual ways that we can stop medication errors from occurring.

These are some references that we refer to and they'll be available, if anyone wants to see them, for all the studies that I had mentioned in the introduction.

And now I'll hand it over to Angela.

MODERATOR: Thank you very much, Dr. Horn, for that great introduction.

We are now going to move on to Dr. Wessel who will present findings from a medication-safety project that she conducted. She developed an indicator for monitoring prescription errors and a program for disseminating feedback about the errors to medical practices.

DR. ANDREA WESSEL: Great. Thank you, Angela. And Dr. Horn, I appreciate a really great kickoff to the webinar.

I'd like to begin by acknowledging my research team. I am speaking on behalf of our multidisciplinary team at the Medical University of South Carolina, and you can see my co-investigators listed there. I'm also presenting work that was developed and the lessons we learned from PPRNet practices across the country and I'd like to acknowledge our grant funding from the Agency for Healthcare Research and Quality.

In terms of the overall objectives of today's webinar, my focus is really going to be on the second objective and that's to examine successful error prevention strategies from real-world practices. My vantage point for this is in the medication-safety project that we just recently finished in PPRNet. MS-TRIP is our acronym for Medication Safety and Primary Care Practice – Translating Research into Practice. And this was a three-year project; again, conducted in 20 of our practices.

We first set out to develop a set of medication-safety indicators that was relevant to primary care; that incorporate these indicators into quarterly audit and feedback reports from EHR data extracts; and then, finally, to assess the impact of the medication-safety-focused quality improvement model on practice performance with these indicators.

What I plan to do is give you a brief overview of the project so you can understand the context for our medication safety learning environment and then we'll move on to a more in-depth examination of these error prevention strategies.

In terms of background, PPRNet or the Practice Partner Research Network, currently has 182 member practices in 42 U.S. states. These member practices regularly submit data extracts from their EHR for quarterly quality improvement reports as well as research purposes. Our practices use a common EHR, which is part of the McKesson suite of products that have a number of medication-safety features included within the system itself. Some of these are information technology decision support tools that many of you are likely familiar with – allergy, drug-drug, and drug-interaction alert – that pop up during the prescription writing process.

But it also includes dosing calculators that can be invoked at the time of prescription writing as well as medication monitoring prompts that are displayed in the patient's chart along with other preventive services recommendations or other disease management monitoring recommendations. And so this is the common theme or the common denominator that each of our practices have integrated within their EHR.

Twenty practices volunteered to participate in the MS-TRIP 2 project; again, that started in 2007 and just finished up this past September. Seventeen of these practices were family medicine and three were internal medicine. They represent 14 states from across the country and, as you can see in this somewhat abbreviated demographics table, they largely represent small, private, primary care practices.

The median number of adult patients per practice – because our focus here was on the adult patients and relevant prescribing and monitoring errors – was close to 2000 per practice.

Our multi-method quality improvement intervention, that looked at disseminating medication-safety strategies, was delivered over a two-year time period. And the three different types of intervention included reports, site visits, and network meetings. So I'm just going to walk through a couple of the features of these to help you, again, with just some background understanding.

Our quarterly reports, again, are based on quarterly EHR extracts that our practices regularly submit and they provide practice feedback or performance over time; both on our categories of indicators so the practices can see their performance over time, and it also gives them the opportunity to benchmark their performance with other members of the network. Our reports also include lists of de-identified patients; so highlighting those patients on high-risk medications, highlighting those patients with potential errors, based on our indicator set so that practices can act on those.

The second component was annual site visits and these allow for individualization and customization of medication-safety-improvement strategies with individual practices. These are onsite meetings with the entire practice staff and providers. Our general agendas include time for academic detailing related to medication safety in general and then also specific to the medication-safety indicators that may have warranted some improvement for a given practice.

We focused on practice-performance review and improvement planning in the local context and then quality-improvement implementation assistance, again, based on individual practice needs.

Our network meetings also occur annually and this is an opportunity for representatives from each of our practices in MS-TRIP to come together to share best practices with one another and then we also can be in small group workshops focused on how to overcome challenges in implementation; again, getting to the nuts and bolts of how nurses do what they do to help improve medication safety in practice, how certain providers implement these strategies in their office settings and build on that group learning benefit.

This slide shows the five categories of preventable prescribing and monitoring errors that are included in the MS-TRIP indicator set. And again, these are the indicators that we provided feedback to practices on throughout the course of the intervention. And beside each category, the number in parentheses here is just the number of indicators included in each of these groups.

Our indicator set was the result of a consensus development process that was employed during the first year of the project. Just to highlight a couple of examples of these categories – and actually, there's great overlap between the high-risk medications and classes of medications that Dr. Horn and ISMP have put together and these indicators as well.

In the first category of avoiding potentially inappropriate therapy, one example of our indicators here is potentially inappropriate medications in the elderly. (coughs) Excuse me. It was in our dosage category. We have measures that reflect dosages based on renal function as well as doses of certain high-risk medications in the elderly; for example, short-acting benzodiazepines.

In our drug-drug interaction category, one example is the use of macrolide antibiotics with digoxin as well as a number of other indicators in that category. Within drug-drug disease interactions, one example in our high-risk older patients is the use of anticholinergics in patients with dementia. Another example here, in terms of one of the indicators that received a lot of attention, was the use of nonsteroidals and COX-2 inhibitors in patients with congestive heart failure or patients with hypertension.

And then the monitoring of potential adverse events; again, getting to preventable adverse reactions here. We developed indicators around monitoring of diuretics, hemoglobin and platelet monitoring in patients on oral anticoagulants – just as examples.

This graph shows our qualitative results, again, over the two years of our MS-TRIP intervention. The caveat I'd like to share with the audience is that these data are currently under peer review for publication and so, at this point, they're still being peer reviewed in terms of me being able to share this with you today. But I wanted to briefly highlight these results as we move into talking about what practices actually did and the things that they worked on.

This shows our median performance over time in each of the categories of indicators. And what you can see is that there was high baseline performance in several of our categories and then there is also some significant improvement observed in three of the categories over time. Those

three categories were: avoidance of potential drug disease interactions; avoiding potentially inappropriate therapy; as well as the monitoring category.

In terms of how many patients or who was included in this denominator, there were about 40, close to 50,000 adult patients across our 20 practices that were eligible for any one of the medication safety indicators over time.

So again, with these first few slides, I hoped to set the stage in terms of our learning environment for medication error prevention strategies and now transition over to the lessons that we learned from our primary care practices in this project.

Through a combination of site visits and network meetings, we gathered practice strategies for improvement and the overarching themes of these safety strategies fell into four categories. And these four categories are listed here and show some common themes in terms of other medication safety work. And what I'll do in the following slides is expand on each of these categories with some specific strategies in terms of how and when practices implemented these things.

The first is related to medication reconciliation, which is a hot topic on everyone's list, regardless of your practice setting. And that's assuring the accuracy of each patient's recorded medication list. The second is related to information technology and the use of health information technology into routine care. The third set of strategies are around implementing refill and monitoring protocols that are used, again, on a day-to-day basis. And then finally, the use of our performance reports as an audit and feedback strategy.

The first safety strategy that I'll walk through today employs a number of things in terms of what practices worked on. The first seems rather basic, but a consistent improvement strategy for our practices was that each provider in each practice agree to document all medications prescribed, whether that was samples or over-the-counter or nonprescription therapies as well as prescription therapies that are prescribed by practice providers to have those all documented on the EHR medication list. Practices then implemented a process for patient review of individual medication lists and they got significant mileage out of asking specific questions – (coughs) excuse me – specific questions around nonprescription therapy and medications from outside providers. (coughs)

Some practices employed web-based EHR portals or web-based tools to review these medication lists and provide them for patients after visits. The majority of practices, however, distributed printed medication lists at the end of each visit to complete this circle.

(pause)

In terms of the decision support piece, (pause) the practices undertook a more proactive safety approach by reviewing alerts and adjusting prescribing as necessary based on the use of these tools. (pause) And this is just a screenshot of the dose (inaudible at 0:25:48). (coughs)

I apologize. My cough has come at the very wrong time. (coughs)

The practices acknowledge suboptimal use of these tools and used opportunities during site visits and network meetings to refine their practices' approach and refine their training of use of these tools throughout the course of the project.

(pause)

The design and implementation of refill and monitoring protocols were employed to improve performance on our monitoring indicators – (coughs) Excuse me; I definitely apologize to the audience – and practices implemented these protocols along with other standing orders that they implemented with use of the EHR tools in the record.

(long pause)

And the final category here is use of reports. This screenshot shows a very brief example on the feedback provided to practices on the dosing measures. Practices were able to use these reports to decide what worked best in terms of case management for their individual settings. They could use these reports to identify patients at risk for errors and then decide (coughs) whether to contact providers regarding these issues, highlighting potential errors on the medication list, or contacting patients with either monitoring recommendations or instructions or specific dosing adjustments.

(pause)

I hope in this brief overview of the strategies that we've learned from our practices, I've given you just a hint of what people were able to implement. And in conclusion, in the context of this multi-method, medication-safety-focused quality improvement intervention, our practices implemented a relatively consistent set of safety strategies. They used their entire team to redesign the way they approach medication safety, both related to medication reconciliation as well as monitoring protocols and refill protocols. They reorganized and kind of reenergized their patient activation approaches, being certain that patients understood why it was so important to either bring their medications into visits and be an active part of the medication review process and then enhancing their use of health information technology tools at the point of care.

And at this time, I'm going to pass it back to Angela and we'll be more than happy to join – we'll join the group at the end with questions and answers and we'll also be happy to answer questions via e-mail if my voice does not cooperate. But again, I appreciate your attention and patience through my presentation.

Angela?

(long pause)

COLLIN: Angela, I think you may be muted.

MODERATOR: Hello?

COLLIN: Hear you very faintly.

MODERATOR: Is this better?

COLLIN: Yes, it is.

MODERATOR: OK, I'm sorry. I was saying thank you to Dr. Wessel and that we would now transition to Dr. Lehmann who would present insights about using information technology to monitor medications for vulnerable populations.

Dr. Lehmann, the floor is yours.

DR. CHRIS LEHMANN: Thank you so much, Angela. Good afternoon, everybody.

My talk today will be using health IT in a practical manner in a hospital or practice environment. And I will give a couple of examples of things that we have done at our institution that are small intervention, low cost, and have generated some significant improvement in the way we are dealing with medication safety. Towards the end, I will talk a little bit about the challenges of health IT and I also will talk about how to pick the projects in your institutions that might be low-hanging fruit.

I started out using health IT for medication safety when I was standing one day in the newborn intensive care unit and watched a resident make the same mistake I'd seen another resident make the year before, another resident a year before that, and I myself had made that mistake approximately five years earlier and that was in the medicine overdose. And ever since then, I've been very interested in how I can use health information technology to improve safety.

Errors occur all the time. You know that. None of us is safe from making errors. Even the most controlled environment and the best checks and balances can still leave our patients vulnerable to the mistakes that we as providers make. There are different approaches to that. There's the person approach where we can point fingers at each other and assign blame or focus on individual people and say, "You're just a bad nurse, a bad physician," and that can be a very punitive approach in nature.

However, in the last several years, in the last 20 years or so, we have been paying more and more attention to systems approaches. If errors occur, it's because there are system vulnerabilities. If you haven't read the article by James Reason, as noted on the slide, I highly recommend it. It's a fantastic piece that talks about the Swiss cheese model of how system vulnerabilities line up in order for an error that usually would be caught through the system; holes line up and the error can actually reach the patient.

When we focus on system vulnerabilities, the goal is to prevent errors from reoccurring and it's supposed to be constructive and inclusive in nature. But the reason why we're starting to focus on system failures is that our own errors and fallibility are only a part of the problem. We know very well that system errors account for the vast majority of drug events, so a study by Leape and others in '95 showed that 75 percent of adverse drug events were associated with the lack of

disseminating pharmaceutical information and a lack of checking drug dose and patient identities and the absence of the appropriate information on the patient that providers needed to know to make the right decisions.

And we also know that injuries are not accidents. In manufacturing, we know that every major injury that occurs – let's say, in a steel mill – is preceded by more than 300 near events and several minor injuries. So we know there are distinctive patterns of errors that occur and we understand that there are system issues related to that. You heard earlier that there are certain groups that are vulnerable populations and with better understanding of our harmed patients, we can develop profiles and target our interventions based on these profiles.

And the most important thing to remember is focusing on the individual is just distracting you from preventing the next error. It's important to close the holes that allow errors to reach patients, not to punish people.

So one example of a medication management tool that we developed at Hopkins is our Narcotic Prescription Writer. And this was developed early, before we had provider order entry, and it's still used for any narcotic prescriptions that patients are sent home with. You can see a copy of a narcotic prescription. It was written on safety paper and somebody faxed it to pharmacy and then you get this distinctive background pattern. And when I ask audiences usually what the dose is of the methadone on this prescription, I get all kinds of answers that range from 36 to 6 to 16 and rarely ever do I hear the right answer of 0.6.

So there obviously are a number of things wrong with this prescription. We have a patient that's a pediatric patient with an age of three years and – let me see if I can highlight that. So you have your three-year-old patient and what is lacking is any kind of dose calculation that would allow a pharmacist to understand how the final dose was derived. You also see that the leading zero for this dose of 0.6 is missing, so obviously this patient received the wrong dose – I'm very happy to report it was only a ten-fold overdose – and ended up in the hospital.

So we looked at all narcotic prescriptions that were written when patients went home and we found rule violations, like having the dose not being calculated by weight, and errors on more than 80 percent of the prescriptions we were sending patients home on; based on narcotic prescription with a high risk for harm. So we decided we were going to build our own narcotic prescription writer.

Here you see the errors that we found on those 300 prescriptions. Most of them were insignificant; however, we had about three percent of errors that could have led to significant harm to the patient if we would have let the patient get that prescription filled.

So our narcotic prescription writer was really designed and implemented – I am not exaggerating – in under three weeks. I did most of the development and we had a pediatric pain service physician; a (inaudible at 0:37:44) expert. We identified drugs that we were interested in using this prescription writer for. And when you pull it up, it's a web-based tool. When you pull it up, you see that the dose is defaulted, the frequency is defaulted, and suggests that duration is also defaulted as well.

So the provider can change these and when he or she does that, you will see that certain information shows up on the next screen then. You can see that the system is aware of how the medication is dispensed. You can see, in this case, it's either dispensed as a liquid in 1 milligram per mL or as a medication dose per tablet. And it tells the provider if you take three tablets, which is the closest dose you can reach with a tablet, you have a rounding of approximately nine percent.

And in this case, I've obviously made a mistake. You will see I got a slew of warnings. We built both soft limits and hard limits into the system. The soft limits allow any provider – these are the ones in yellow – to override a dose warning; however, once you read a hard limit, only people who are on the pain service team can override those. So if the provider, on this screen, selects the dose – if the original dose is correct; likes the way, the form of the drug is dispensed – and what it generates, it generates a legible prescription that has an enormous amount of safety features right built in. You can see, again, we have the age of the patient and the date of birth; the weight is provided.

One of the features that our residents requested were that we include information about dispensing amount because they were worried that people would change the 30 milliliters to 300 milliliters. So we included the total dose as a word and you can see that the pharmacist gets the information on how the dose was derived. So the original dose was 0.05 milligram per kilogram and there was some rounding that occurred and this is the final dose that we wanted. Other information, because our providers have to log in – like the DEA number and our Hopkins physician ID – are automatically populated on this page.

Implementing this resulted in significant changes. We looked at how many prescriptions were generated based out of the 5,000 attempts and if you received an alert – and we had about 700 prescription word (ph) providers received an alert – two-thirds of them – not quite two-thirds but more than 50 percent of them were abandoned. So it was a significant change in behavior and then providers would go back and try another attempt on this.

So as I said, this is still in use after we implemented it more than six years ago before we (inaudible at 0:41:05) provider order entry. It still generates the prescription for patients that go home. It was somewhat challenging to make sure that we had the new safety paper that is required available on all the units but, as I said, it has drastically improved our narcotic prescription prescribing.

We know there are lots of things that we are supposed to do when we write prescriptions. And especially in pediatrics, the weight of the patient is very, very important. We know drug allergies are critical. Avoidance of abbreviations is very important to prevent errors downstream. We tend to be rather vague in our instructions when we write on papers and being specific is important. The exact dose strength information providing is critical. The avoiding of terminal zeros to the right of the decimal and the use of a zero left of the decimal when the dose is under 1 are critical to prevent dosing errors. And of course, legibility.

And if you look at this list, all of these things can be done if you use a health information technology system that is designed for pediatric dosing. So computers are great in doing those things that we, as providers, tend to do poorly and can have a significant impact and positive impact on medication safety.

When we started out, we asked ourselves, "How do we change error rates?" And we know if we do an educational intervention and we tell our providers, "You have to stop using abbreviations" and we measure the impact, after two months, we still see an impact; we measure again after six months, the effect is gone, unfortunately. We know incentives work well but most of the time that comes at a significant cost and we can't afford it. So we discovered using automation is something that drastically reduces error rates and it can be done in a cost-effective manner.

Just to give you a couple of examples that I'm not going to show you slides for, we introduced a TPN calculator because we had approximately an error rate of 11 percent. So 11 out of 100 TPN orders had some kind of error problem associated with them, so we built our own TPN calculator. It took about two weeks to implement and set up as a web tool. We had an error reduction of over 90 percent. We also built an infusion calculator for continuous infusion medications and reduced errors, again, over 88 percent.

Because the functionality that we were able to build in this small, little project in a very short period of time exceeds what's available in most commercial systems, when we introduced our provider order entry, we put our clinical decision support that we had developed on top of the provider order entry in order to do all that fancy decision support that we were used to having.

So going back to errors, we humans err in very unexpected ways. And machines tend to be more dependable. They do the same checking of task lists over and over again without getting tired, without getting distracted. However, machines have a significant drawback and all of you who are Windows users and have encountered the blue screen of death know once something goes wrong with a computer, once unexpected behavior occurs, machines can't respond to that. They're terrible at that.

There's a good reason why we still have pilots in planes. Planes these days can take off, fly, and land automatically. We have pilots in planes because humans are incredibly resourceful, inventive, and flexible and are much, much better to recover from errors. So our approach here at Hopkins has always been we need a combination of human/machine because it allows us to prevent the weaknesses of both and utilize the best features that both of them have.

So another little practical project that I was going to show you – and this took about a week to put together – even though we have provider order entry, when it comes to an emergency situation, if a patient is arresting, it helps to have the medication doses available in advance. So we decided to look at the sheets that we had at every bedside where nurses have, in advance, calculated all the dosing of arrest medications in advance. And we found that approximately five percent of the code cards that we had hanging on our beds had errors on them in dosing. And especially in infants, in the newborn intensive care unit, they were outdated because the weight changes so frequently.

So within a week, we put a little tool together that is also web-based. A nurse enters the weight in the patient's name and when that is done, it generates – and this is only a piece of it – an automatic code card that is printed out and put by the bedside. Every Friday, all the code cards in the NICU are updated because of weight changes. And on the floors, it's much less frequent but it drastically improves the availability of arrest medication in an emergency situation.

So you heard me talk about the advantage of health information technology and I only showed you examples of things that we have developed. There's a lot of hype out there on the use of computerized systems with the ability to improve outcomes and quality. A lot of that is true. The information that is out there, how people have used these systems and implemented them successfully, truly has benefits to quality. But the important thing to remember is these systems are difficult to implement and to design. Most of the systems that you currently can buy out of the box, come with somewhat limited functionality and it is up to you to implement the advanced clinical decision support systems.

So what comes out of the box, especially in pediatrics, is usually not ready to drastically improve outcomes. And we just saw that a recent study was published in the Archives of Internal Medicine in January that showed no connection between EHRs and quality of care. However, if implemented right, health information technology can drastically alter outcomes, as many have shown over the last several years. Keep in mind, though, that it is only one of 14 medication safety recommendations that was an Institute of Medicine report and many of the people that are pushing it clearly have some conflicts of interest.

However, having said that, I personally have been drinking the Kool-Aid, so I believe that health information technology can drastically improve the way we practice medicine and it's no longer an option going forward into the future. So we all have to be able to use information technology; implement it so that it improves outcomes.

Some challenges that I wanted to go into – when you design a system that writes orders electronically, one of the problems that we always run into is that written orders on paper have expressed intent and they were then interpreted downstream by an expert and translated into actions. Now that we're using health information technology, we have to be much more precise. We have to know about nuances that we usually don't think about as providers – when the drug needs to be scheduled or stopped – and there has to be an enormous amount of granularity.

Further, most systems that allow you to order medications generate picklists that have lots of unfamiliar options and the first option in a list is not always the one that you should be using and this generates, oftentimes, more work. Those people that were helping to interpret an order in the past, now turn into people that just reject your order and require the physician to reorder it again.

One of the things that was mentioned earlier is the importance of drug-drug interactions and drug allergies checking. I just wanted to give you an example of bad things that can come out of the box. When we introduced our provider order entry system, 15 percent of drug orders triggered alerts and the house staff overwrote 97.4 percent of alerts. Clearly, these alerts were not clinically significant. Of the few that resulted in order changes, unfortunately two-thirds generated warnings that were inappropriate; so we had patients that were post-cardiac cath and

their aspirin and Plavix was alerted and said, "You shouldn't be on both of those drugs." Well, the patient should be.

Oftentimes these systems come with very ambiguous and long-winded messages that are not helpful to providers and so people quickly become fatigued by those alerts and start to avoid them. Oftentimes these systems are not able to distinguish, based on how the medication is given. If I give an (inaudible at 0:52:06) beta blocker, then I should not be getting an alert with a drug where there's an interaction between a systemic beta blocker.

Unfortunately, our experience, just going to electronic systems also doesn't necessarily mean you're using less paper. We ended up, in the beginning to have a lot of printing out because we needed to have a backup system. And once you print orders that seem to be quite nice on the screen, it tends to be very large and cumbersome for people downstream who have to manage them.

Other challenges that we continue to encounter are juxtaposition errors; when we have clicks where medications, where items need to be clicked or dates need to be clicked, where people err by a few millimeters. To give you an example, we had a patient in the intensive care unit who was septic and a resident ordered antibiotics and, by accident, clicked a week from the day she was ordering it. So while the order showed up as active, it was obviously not dispensed because it was ordered for the future and it took the care team a day to figure out that the patient wasn't receiving the medication. And that was a two-millimeter difference in clicking.

One of the challenges that we had in the beginning was that the first patient on the list was always highlighted, so we had a lot of patients who received the wrong medication orders that were intended for somebody else.

The other thing to consider when implementing a large-scale system, health IT can also be a significant cost. While it drastically can improve your performance, if you fail to implement it correctly, it can lead to high-profile failures and significant challenges. The cost of buying a system is only a fraction of the total implementation cost. There are some data out there that implementing systems that you improve your medication safety can result in cumulative net savings of millions of dollars and have breakeven points after somewhere between five and eight years.

So at this point, I'm going to conclude with the thought that we can use, we can leverage computers to make our care safer. It doesn't necessarily have to be big systems that are purchased. You can start small with interventions that are tailored to your environment. You can address issues that are specific to your practices. There are lots of tools out there that allow you to implement solutions quickly. And if you do decide you want to go with a large-scale, let's say, provider order entry system that reduces medication errors, the implementation is a critical piece and implementing right is the key to downstream success.

So at this point, I'll stop and thank you very much and I turn it over back to Angela.

MODERATOR: Thank you, Dr. Lehmann.

To conclude our teleconference today, we are going to hear from Dr. Horn and Miss Smetzer. They are going to present strategies that will assist pharmacies in implementing methods to actively reduce the risk of error, particularly with high-alert medications. In addition, they will also discuss tools that are currently being developed by the ISMP to reduce the risk of potentially adverse drug events.

DR. DONNA HORN: Thank you, Angela. This is Donna. Judy, my colleague, and I will be discussing our research that we've been doing for the past three, four years. We also would like to acknowledge the support that we've gotten from the Agency for Healthcare Research and Quality in order to conduct these studies and this research.

We have divided our study into two sections because year one we actually worked on developing our high-risk drugs, the ones I talked about at the beginning, for community pharmacy. And we developed more than a dozen detailed socio, technical, (inaudible at 0:56:31) risk assessment models to decrease errors in community pharmacy. And Judy's going to talk more about what those STPRA models look like. But based on these risk models and the findings that we had in year one, we were able to develop three interventions to address the vulnerabilities in dispensing high-alert medications, and that we'll talk about in what we're doing years two to four in our research.

So in year one, our goal was to look at the process of looking at medications, how they're actually dispensed in a community pharmacy. And we did this through modeling pathways and we looked at error pathways as well. We actually had an expert advisory panel that we worked with – pharmacists and technicians working in community pharmacy from across the United States – that helped us map out these processes and we were able to qualify some of the risks based on their thought process and the STPRA model.

So for instance, one of the things we looked at was errors that occur at the point of sale. That's when a patient is picking up the prescription: initiating errors, such as a bagging error – meaning that the wrong medication is in the bag or somebody else's medication is in the bag or a medication is missing or an extra medication is in the bag, meaning that the receipt on the outside of the bag does not match what's inside it.

The other type of error that we saw was retrieval error, meaning that the wrong patient went home with someone else's medication, whether it was filled correctly or not. That usually happened because either there was no ID process with the patient or there was difficulty obtaining the birthdates from the families or friends. But what we did look at was that there's about a 64-percent capture rate for this type of error, meaning that it may initiate wrong but the patient does not go home with the wrong medication.

One of the pathways we looked at for reducing errors was to actually model opening the bag at the point of sale, so that the clerk opens the bag in front of the patient or the caregiver and checks to make sure that's what's in the bag and what's on the receipt match. When they do that, we were able to put the calculation in and we found a 56-percent reduction in preventable adverse drug events when the bag was opened at the point of sale.

We acknowledged, through our focus group, that about 50 percent of the patients are asked for an ID at the point of pickup. But if we can increase that to 80 percent so that 80 percent of the people were actually getting asked for their ID at pickup, we were able to model that to be 34-percent reduction in that type of error.

We also looked at the error pathway of patient counseling. We did acknowledge, from our focus group and from studies, that about 30 percent of patients who come to pick up a prescription are counseled or given some education about their medication. If we model that at 80 percent, meaning we increase that to 80 percent or 80 percent of the patients are actually being counseled about their medication, we could further reduce – we could have a reduction of 27 percent in wrong errors going out at point of sale. If we put all three of those interventions together, we got an 86-percent reduction in errors at point of sale.

Another pathway that we modeled was selecting the wrong dose. We chose the drug warfarin because there are 10 different strains of warfarin available. So the initiating error rate would be one in ten prescriptions.

We were able to have a 99-percent capture rate – a very high capture rate – because the focus group that we were working with had what we call bar-coding at product selection. So during verification, when they're picking a drug from the shelf, they were able to bar-code both the stock bottle and the patient receipt and they could get a match. If they didn't get a match, then they would return it and get something else. So they had a 99-percent capture rate because of bar-coding.

If we eliminated bar-coding, which we were able to do through our process, we eliminated the bar-coding – we put the numbers through to see what would happen; we actually got a 95,000-percent increase in risk. So instead of nine prescriptions in 10 million going out incorrectly, we had nine prescriptions in 10,000 would be going out incorrectly.

We also noted that some stores use what we call a cheat sheet. It's a work-around. So instead of scanning the stock bottle, they actually scan a pad that has the bar codes pasted on it. So you can imagine that they're not actually scanning the stock bottle that the medication came out of. That creates risk. And in fact, if they do use a cheat sheet 30 percent of the time instead of using the actual stock bottle, we saw that they had a 265-percent increase in risk, or two per 10,000 prescriptions.

Again, we modeled increasing patient counseling from 30 percent to 80 percent and we were able to show a 67-percent reduction in risk if that were to occur for the wrong dose of warfarin. And then if we increase automated dispensing – not every store has automated dispensing but the ones that do; we imagine about 20 percent – if we would increase that to 50 percent, because they have bar-coding associated with automated dispensing, we would get a 35-percent reduction in risk. So if we put the two together, the increased patient counseling and the increase in automated dispensing, we were able to model the 78-percent reduction in risk (inaudible at 1:02:16) wrong dose of warfarin.

We also wanted to model prescribing errors. It's hard to capture errors at a pharmacy about prescribing errors, because there isn't a lot known, necessarily, about the patient or the indication for the medication in a community pharmacy. The pharmacist is limited to what the patient tells them or what the prescriber might have told them or what might be written on the prescription.

So we looked at fentanyl patches because we know that you have to be opioid-tolerant in order to use fentanyl patches without having an adverse drug event. So we had initiating error rate of 1/1,000 prescriptions. If we were able to obtain the opioid history at dropoff – so when the patient drops off their prescription and we were able to obtain that history – we could have a 40-percent capture rate of prescribing error; so a 40-percent decrease in risk.

On the other end of the scale, at patient counseling at point of sale, if we were to increase that from 10 percent to 80 percent – so we take an active role in patient counseling for fentanyl medications being dispensed – we got a 64-percent decrease in risk. So both of these methods allow us to know more about the patient and when the pharmacist at a community pharmacy knows more about the patient, they may be able to pick up a prescribing error. And in fact, when you put these two interventions together, there'll be a 78-percent decrease in risk of getting the wrong dose of fentanyl for people who aren't supposed to have fentanyl at all.

So our discussions and our conclusions at the end of this first year, we realized that prescribing errors are hardest for us to capture but if we had more frequent and effective counseling, we could reduce adverse drug events by 64 percent. We're able to have more of an effect on dispensing errors because we have a second verification process or opening the bag during sale, we have bar-coding. So we're able to have a more reliable way of reducing dispensing errors. Pharmacists use bar-coding; use automated dispensing. Or you have pill imaging where the pill or the tablet is actually shown to them at the point of verification so they can see in the computer if the tablet matches what's in the vial; they'll have a better method of decreasing dispensing errors.

So years two to four we actually wanted to work on our tools, so that's what we're in the process of right now. So in the first intervention, we're implementing a mandatory patient counseling on the medications that you see on those slides. Those were the selected high-alert medications that we chose for our patient counseling intervention. We're doing a pre- and post-evaluation study. It's observational and we're using self-reported data as well. The second intervention is preparing for implementation of a bar-coding technology. And again, we're using pre- and post-test design to measure the value and to project and prevent technology problems when adding bar-code technology. And our third intervention is the one Judy is going to discuss, so I won't mention anything about that right now.

So our first intervention, patient counseling – we've been to four different states. Two of them have mandatory counseling, which means that the pharmacist is required to talk to a patient about their medication when they pick it up; and two states have mandatory offer to counsel, which means anybody that's working in a pharmacy can ask the patient if they'd like to speak to the pharmacist about their medication.

We found, in the states with just the offer to counsel, there was no counseling going on. There was counseling for over-the-counter medications more than there was for prescription medications. But even in the states where there was mandatory education on prescription medications, we found that they weren't really covering specific information about how to prevent adverse drug events.

So for example, they didn't say to the patient about how to dispose of fentanyl patches. They didn't tell patients on insulin how to avoid mix-ups if they're taking more than one. And they didn't talk to people who were on warfarin about how to stop and restart their warfarin doses.

So our patient counseling toolkit includes scripted counseling materials. So we're providing the pharmacist with a checklist of information that we think they should use when they're dispensing high-alert medications. We're going to actually go into the stores – we haven't done this yet – and after we give the pharmacists the materials, we're going to teach them how to use them and we're going to watch the interactions and observe them; again, in the 50 different pharmacies in four different states. We're going back to the same stores that we went to, to see if it made a difference, and we're going to actually try to get information about what causes – what targets will prevent these adverse drug events and we're going to have surveys for both the patients and the pharmacists on how they perceive this.

This is just an example of one of the sheets that we have. This is for warfarin. We have not completely finished drafting these yet but you'll see that part of this shows different things about safety. And we know that patients already get information about their medication but, like I said at the beginning, the counseling was not including safety information. So for instance, this sheet on warfarin shows how to tell the signs of a bleeding or a clot and it talks about knowing the dose you're supposed to be taking, what the strength is, and how many tablets of each one to take. So it goes into more specific information and it's designed like a checklist so the pharmacist can actually work with the patient and talk about each one of those different items, and we have about ten items that they talk about.

So as I said, we're going to measure, post-implementation observation. We're going to have surveys for the patients and ask them did they have an increase in understanding, did they get any new information, did it change their behavior, do they understand what an adverse drug event is and how to prevent it. And we're also going to survey the pharmacists to see if they have any perceived value in what they thought the impact of counseling was.

Our intervention number two, bar-code readiness assessment, what we found was that even though we can get a 99.9-percent capture rate for medication errors with bar-coding, we found that about almost 50 percent of community pharmacists in the United States do not use bar-code technology for product verification. So we decided that one thing that would help them would be to see if they're ready to put technology in because, as we know, when technology is added to any system, people will either work with it or they'll work around it or we could end up wasting money and that's what we didn't want to happen when people put in bar-coding technology. I've been in pharmacies where I see scanners laying on the counter because they've given up on their bar-coding technology because it just didn't work in their workflow.

So we're actually using 100 pharmacies to participate in the study. We did a survey to determine why the non-users are still non-users. We are working right now with five pharmacies who are piloting our tool and then they will let us know whether they have any perceived value to the assessment. And then phase two, we're actually going to go back to the pharmacies that worked with us in phase one and ask them, after they've implemented bar-coding, did they have any actual value; did our specimen have any actual value to them.

(inaudible at 1:10:28) a screenshot of what our assessment looks like. This is going to be online but also you can print a paper copy. And you can see that it has a table of contents with a lot of information on it. The first part of it is just the assessment itself and there's about 57 items for leaders and for pharmacists. We've divided it into two different sections, both to capture what the corporate owners or the leadership think need to be done or where they're at with their assessment, and what the staff pharmacists or front-line pharmacists feel; if they're ready for adding technology.

In Appendix A, we actually talk about the uses and the benefits of bar-coding technology in community pharmacy. We talk about the impact of bar-coding; factors that are important in the decision-making; challenges that they might have; selecting the right system; and some of the costs. And then, in Appendix B, we talk about elements to consider during the vendor selection process. So we're trying to give them a whole slew of information about what's available in bar-coding technology and what they should think about before they actually implement it.

This screenshot is just an example of what we're going to be asking them to assess themselves on and some of them are prerequisites and some of them we call facilitators. And at the end, they'll be able to determine, based on how they self-scored on their prerequisites and their facilitators, where they need to put some more work into before they can actually implement a bar-coding technology system in their pharmacy. So it asks for things like space considerations; if they've had any experience with interfacing technology before; and things like workflow, how it's going to fit into their system. And there's about, like I said, 59 items for the corporate leadership to look at and coordinating items for the staff pharmacist to look at.

And now I'll turn it over to my colleague Judy to talk about our third intervention.

JUDY SMETZER: Thank you, Donna.

Our third and last intervention is a downloadable IT tool that we call HAMERS. It's a high-alert medication error risk scorecard. And for this tool, we've taken those risk models that Dr. Horn mentioned and we're trying to create an easy way for community pharmacies to use the structure of those risk models to estimate the incidence of medication errors in their own pharmacies. Our focus is on high-alert drugs but the tool can actually be used for any medication. But again, we're going to try to lead users to focus on the high-alert drugs so that they're really looking at preventable adverse drug events and reducing harm that could possibly happen to patients.

The toolkit itself will include several scorecards that'll be available for different types of medication errors. Each medication error has a different scorecard because some of the questions that we'll be gathering information about are different. But we have several prescribing error

scorecards – one for wrong dose; one for wrong directions; wrong drug – and then we have dispensing errors: both data entry errors, where a pharmacist may enter a prescription into the wrong patient's profile or enter the wrong drug, dose, or directions into the computer; or even drug selection errors where the pharmacist or technician selects the wrong drug or dose from the shelves and fills the prescription in error.

We're also allowing the scorecard to be used for a point of sale error. So when Donna mentioned the bagging errors or picking up the wrong bag to give to a patient with a similar name, we have a scorecard that you can use for that type of error. And these scorecards will actually calculate how often these types of errors get through the entire pharmacy dispensing system and reach patients. And our definition of reaching patients is that the patient received it at the point of sale and walked away from the counter. We did not model the frequency that patients would bring back a mistaken prescription and find it themselves because we did not have any patients in our focus groups when we created the models.

One of the really important parts of the tools, not just the numbers or a quantification of how many errors get through – which I know everybody likes numbers – but it also shows the pathways or the tasks that are most significantly involved in those errors reaching patients. So it allows a pharmacy to really see where the risk is in their organization and helps them target their interventions to get the greatest bang for their buck and to make sure that they are addressing the largest number of problems to reduce the risk of errors.

I thought you might want to see a very, very small example of what these risk models look like. They will be in the background of the HAMERS tool. The user will never see these risk models but we have used the complexity of the risk models to develop our program.

So if you look on the right at the risk model, at the very top is something called top-level event. In this case, for the example, it's an undetected pump failure where a medication was not delivered because of that pump failure. And if you start at the very bottom, there are three basic events that could lead to the pump stopping: one is electrical power failure; one is pump motor failure; and the other is a tubing occlusion. And for each of those events, there is a failure rate that has been assigned to it. So these are just for purposes of example. The failure rates are just set at 1 in 1,000 for right now; just for the purpose of the examples. But in the risk models that we have developed we have actual estimates in there.

Those three basic events, or the reason that a pump might stop, are combined in the risk model with an OR gate. And an OR gate means that either one of those conditions could exist and cause the pump to stop. Now you see to the right of that pump stopping box is one called alarm failure. Well, there has to be a failure of the alarm for the medication to not be delivered and not alert the healthcare practitioner that something is wrong with the pump. So there's also an estimate for how often the alarm would fail. And when you combine those two, it's combined with an AND gate because both of those conditions must exist in order for the failure to occur.

So this is just a small example of the risk models that we were using as the backbone of this HAMERS tool. Now our risk models for each type of error have hundreds of basic events in it,

so they're a lot more complex, but it just gives you an idea of what's driving the tool in the background.

Now we didn't come up with our error rates without looking at the huge body of evidence in the literature related to human error probabilities and equipment failure, et cetera. So in our year-one study, we extensively looked at the literature and looked at error rates that had been evidence-based in the literature for a long time through other high-reliability industries that have done a lot of the studies; particularly aviation, nuclear, handling chemical, manufacturing, things like that. But we, with our estimates of what those failure rates would be, used tables that would tell us what the probability might be based on different performance-shaping factors.

So for example, if we have a well-designed, familiar task under ideal conditions, the error rate is about four out of 10,000. And the best we can do, as a human, is to make one out of 10,000 errors. So we use these numbers to populate those frequencies in the risk models that are driving this new tool called the HAMERS tool.

Now for the actual tool, we've developed a survey. So it consists of survey questions that are used to gather data about the type of errors that are being evaluated. There are first setup questions, so we need to know what type of drug or class of drug that you're investigating. Of course we need to know the prescription volumes for that drug so that we can actually drive the calculations for the risk pathways.

And then we also need to know a little bit about the organization system – what technologies are used, what processes are used with an organization – so that within our risk models that are driving the tool, we can either turn off technologies, for example, that are there or turn off pieces of our risk model tree that don't apply to that organization. So we call those setup questions.

We then asked a series of questions that gather information about exposure rates, capture opportunities, and at-risk behaviors. Exposure rates would just tell us how often something happens. So to use the example that Donna did, how frequently our patient is counseled. For that specific drug, it could vary. So each of the scorecards, you're very focused on that specific drug in answering the question for that drug. But that gives us a rate that can then be attached to some risk assessments that are done for patients who are counseled. We wouldn't want to assume that counseling could capture an error for patients that aren't even counseled. So we have to capture the exposure rates first.

Then we're asking about capture opportunities and we're asking those who will be using the HAMERS tool, based on the type of drug that they're evaluating, what percent of the type of error that are evaluated will not be caught during a particular step, given specific conditions. So they're very specific questions.

And then we're also asking questions about at-risk behaviors; for example, how frequently would staff choose not to ask a customer for a second identifier, a birth date or an address or a telephone number that would help identify that patient from others who have similar or, actually, the same name also. And that would vary based on the type of pharmacy. Community pharmacies in small towns tend to know their clientele very well or their patients very well and

they may have a higher at-risk behavior of not asking customers for that second identifier and then can run into trouble, because it's not a practice habit, when a patient comes in that they don't know.

The last piece of input for the HAMERS tool is human error rates. And we have gone through all the basic events, so there's hundreds of basic events for each of the scorecards, and we've been able to preset a lot of the human error rates. We don't need to ask people to estimate error rates that we already have data for, based on human factors literature.

So because of that, we have narrowed down the data that we need to get from each pharmacy to about 40 questions for the most complex error, which would start with the prescribing error, down to about 22 questions for errors that occur at the point of sale because you just don't have as many steps to ask questions about. So it's not as extensive a process as it was when we were creating the models. That took us dozens of focus group sessions that lasted four to six hours each and it took us an entire year to complete. So we really diluted down how much time would be required to capture that information.

Now the output that the user will get after answering the 40 questions based on the particular drug that they're investigating is a scorecard that quantifies the amount of risk with that specific preventable adverse drug event. So for example, if you were looking at warfarin and you're looking at a particular type of error – let's say a dosing error – you will actually see that maybe three out of 10,000 prescriptions for warfarin go to the patients at the wrong dose. They actually reach a patient. So you'll have a quantifiable number from this scorecard. It's an estimate based on your practices, the pharmacy's environment, their work processes, their workflow, their staffing patterns, the equipment and technology they use. Based on all of that, it's very unique to that pharmacy what their risks are and how often that would result in an error that reached the patient.

Importantly, we're also going to show a bar graph – and with a little more detail than what I'm showing you as an example on my next slides. But we're going to provide a bar graph that shows the distribution of risk. And by that, we have a bar graph chart that shows you which tasks and elements contribute most to that preventable adverse drug event and that allows the organization to – it allows the pharmacy to make sure that their error-reduction strategies are focused on where most of the risk is.

And then we also have a wonderful part of the tool where we will be able to make some recommendations on interventions and actually estimate what the potential impact would be if you made changes in your system; very similar to what we did in our study. We also will allow pharmacies the capability of putting in any intervention that they come up with, not just the ones that we recommend; and they can evaluate, again, the assessment of that drug in all their practices and they can determine themselves what percent of risk will be reduced if they implement that interaction.

So we had created some screenshots that I thought might be helpful in trying to visualize what this tool would look like. Our screenshots are only for the programmer and our graphic designer, so they won't look exactly like this but it gives you an idea of how we're setting up the questions

and the items for the pharmacies to answer. Of course there'll be instructions which will be somewhere on the screen. We'll have some demographics and some denominator information; for example, you need to tell us what medication is being investigated and then they need to give us the prescription volume so that we can have a denominator for the program to run the calculations.

The exposure rates, one example is what percent of prescriptions for these medications are entered into the pharmacy computer by a pharmacy technician or a pharmacy associate, the term that we use. And we'll give little notes to people so they can answer as accurately as possible and then we give them answer choices in certain increments and there always will be instructions on the screen and definitions that they can click on so that they can answer as accurately as possible.

An example of a missed capture opportunity would be asking a question such as a pharmacist is entering a prescription into the profile of an existing patient who has previously taken the same drug or another drug within the same class; on average, what percent of the wrong dose prescribing errors will be missed by a pharmacist during data entry. Now the questions will be very specific to the drug and the type of error and will spell out the conditions under which you're making that determination.

We do have to ask the pharmacists themselves and the pharmacy staff to answer that question. We can't preset that data because it differs based on different processes in the organization and also differs on the type of drug that's being evaluated. Now we also ask about at-risk behaviors. I think we identified maybe about 20 at-risk behaviors. Donna mentioned one using a cheat sheet for bar-coding. Another one would be skipping through alerts that don't appear to have clinical significance and developed a bad practice habit of doing that; so what percent of the time does a pharmacist ignore the duplicate therapy alert for the medications in question or fail to give the alert their full attention. And we have preset some of the at-risk behavior rates with lower limits that they can't go below. So for example, for a duplicate therapy alert, you have to acknowledge some at-risk behavior or some percent of at-risk behavior in the organization.

And just to give you an idea – I know you can't read the items on the left side of this bar graph – but this will be the bar graph that organizations will receive as part of their scorecard that gives the rank order of the contributors to risk. And you can see the real purpose is to focus on those things at the very bottom, the tasks and the exposure rates and the conditions that are listed there, that actually lead to the highest rate of the potential adverse drug event getting to the patient.

So we're real excited about this tool and we hope to have it up on our website by September of this year. This is for community pharmacies and based on its evaluation during this research period, we're hoping to also be working on one for hospitals and other outpatient facilities.

So I'll turn it back over to you, Angela.

MODERATOR: Hello?

Hi. Thank you. Thank you, Judy.

At this point, I just want to thank all the presenters for their very thoughtful presentations; want to thank the audience for joining us today. You should see, at this point, probably a link – or if not now, coming very soon – for the evaluation. That's very helpful for AHRQ if you would fill that evaluation form out.

And we are now going to move into the question and answer portion of the national teleconference. I do have, on my screen, one question so far from the audience. The question is, "I've heard a lot about preventable ADE versus potential ADE. Could you distinguish between the two?" I think this is a question for the entire panel.

(long pause)

COLLIN: And just remember, your lines may be muted, so go ahead and unmute. Also, if you want to submit additional questions, just click on that Q&A button you have at the top of your panel there so that that window will open up so you can submit your questions.

MODERATOR: So did any of the presenters maybe want to address this question?

DR. ANDREA WESSEL: I'd be happy, Angela, to answer it from our perspective. This is Andrea Wessel. I was the second presenter on the webinar. And for our purposes, the distinction that we make between potential adverse drug events compared to actual drug events are picking up on indicators that would give practices information on problems before they occur. So for example, picking up on patients that haven't had certain monitoring done and using that as a process indicator or a process measure as opposed to looking at actual problems in individual lab parameters.

And so that's one distinction we make within the confines of how we've defined medication safety indicators. I'm sure that Dr. Horn or some of the other panelists from ISMP may be able to give you more background in terms of the definitions in the literature, but that's how we navigated those definitions for our purposes.

MODERATOR: OK, thank you, Andrea. Judy or Donna, did you want to respond to this question?

FEMALE PARTICIPANT: Could you actually repeat the question again?

MODERATOR: Sure. The question is, "I've heard a lot about preventable ADE versus potential ADE. Can you distinguish between the two?"

FEMALE PARTICIPANT: I think that the preventable ADEs are ones that we know that if you have enough information about the patient or the drug being dispensed, you can actually prevent the error from occurring. Potential – things we call hazards – potential hazards, which means that they may or may not be preventable, depending on how much you know about the patient and how much you know about the medication being dispensed.

MODERATOR: Thank you.

I have no other audience questions but we do have a few other questions for the panel. Let's go to one of these other questions. "Are you surveying patients for their perceived value of the scripted counseling sessions?"

DR. DONNA HORN: I think that would be a question for ISMP. We are actually going to be surveying the patients. We want to know – right now we get this feeling, from the literature and from our observation, that patients don't value counseling. In fact, it may be because the environment at a community pharmacy may not be conducive to actual education. They may not know much about what a pharmacist can give them for information or they think that it's just a clerk they're talking to and the pharmacist is too busy to actually talk to them; so lots of reasons why counseling is not occurring right now.

So we do want to actually measure and get patient feedback on the counseling sessions, so we will be surveying the patients on what they learned, how they thought it would affect their health conditions, and if they would actually want to be involved in counseling in the future.

MODERATOR: Great. Thank you.

I think we have a couple of other questions related to – for the ISMP folks. Why is there a low-capture rate by community pharmacists for fentanyl prescribing errors?

DR. DONNA HORN: Judy, do you want to talk about that one or did you want me to go ahead? (pause) I'll go ahead.

The problems I tried to allude to when I was talking about prescribing errors being captured in community pharmacy have to do with the fact that community pharmacists are limited in the information that they have about the patient. Many patients think that the doctor has already talked to the pharmacist or any information that the pharmacist needs is on the prescription. They don't see the value in actually discussing with the pharmacist their medication usage or their medical history.

And because there's been so much talk about electronic prescribing and electronic records, they think that the information is already at the pharmacy or that the pharmacy has the ability to look up that information and see what else there is going on. So they don't think that they need to provide that information.

So because the pharmacist does not have that information, they rely on the patient to tell them about previous history or to talk about what they know about the medication that they're going to be taking. And many times – because, as I mentioned before, counseling is not perceived to be of value in a community pharmacy where there's maybe your neighbors or other people standing around; might not be very much privacy there – the information is not always gleaned. And if you don't have the information about the patient, then it's almost impossible to determine whether a prescribing error is taking place or not.

MODERATOR: Thanks, Donna.

Actually, back to the counseling sessions, what was the selection criteria for the information on the scripted patient counseling sheet?

DR. DONNA HORN: The information that we put on those sheets – that we're drafting now; so we have to make sure that they actually do make sense – was based on error reports in our advisory group that we have at ISMP. When we look at error reports and we make recommendations and we look at the contributing factors for medication errors, we put all that information together in a simplified way, with language that patients could understand, on those sheets so that we could actually make sure that we sort of bring it down to their level as to what they need to know to be safe when they're taking their medication. So we use past research and the error reports that we get and, like I said, our expert advisory panel.

MODERATOR: OK, great.

We have another audience question, "How will pharmacies be notified when the HAMER tool is ready to go live?"

DR. DONNA HORN: Well usually, at ISMP, when we have a new tool that's available, we have a press release, and we also will make note of it on our website and in our newsletters we will make an announcement. So any one of those ways will make sure that the information gets out. And through the press release, we're hoping that other pharmacy organization magazines and journals will take up the information as well. So that will get that information out there.

MODERATOR: OK, great.

Go back to another question for ISMP. How did you choose the high-alert medications for the community list?

DR. DONNA HORN: We actually did – we had a survey back in 2006, I believe it was, where we asked pharmacists through our newsletter, community pharmacists, to tell us what they thought their high-alert medications were. And we used that against medication error reports that we received on our own reporting system and the Pennsylvania reporting system to the – I think we also used the Med-Marks (sp) reporting system. But we looked at research and we looked at the literature to see which medications are causing the most errors – not the most errors but the most harm when they were either prescribed, dispensed, or administered in error. And we used that information to come up with our high-alert medication list for community pharmacy.

MODERATOR: Thank you.

At this time, I actually have no other questions from the audience. However, you can feel free to still send your questions in. Just wanted to open up the floor, in the meantime, while we give folks a few minutes, to see if the presenters had any questions for each other.

(pause)

OK. And having no other questions from the audience, I think this concludes the Q&A session for this national teleconference.

COLLIN: Alright, Angela.

Well thank you, everybody, for attending. On behalf of AHRQ, I want to thank you all for joining us today and for your participation. I also want to thank the presenters for their excellent presentations.

At this point, I have to ask you, if you haven't already, to please fill out the survey that popped up on your screen. This will help AHRQ to improve their future programs. We certainly appreciate all your feedback.

You'll also be receiving an e-mail in the next day or so that will give you the instructions on how to submit for your CME certificates. That information was also in the e-mail that you received earlier today, so you can go ahead and follow that.

Again, thank you very much for joining us today. We hope you had a great afternoon. This does conclude today's session. To disconnect, you can simply shut down your web browser. Have a great day.