



**Barcoding End-to-End Solutions:
From Pharmacy to Bedside (SP 16 & 18)
June 17, 2010
Webinar Transcript**

Charles Denham: Good morning. I'd like welcome the attendees to the TMIT High Performer Webinar entitled, Barcoding End-to-End Solutions: From Pharmacy to Bedside, and this includes the National Quality Forum Safe Practices 16 and 18. We have a number of live attendees and we are also recording these presentations, and transcripts will also be available for this program.

The background to this program is one that is close and dear to our hearts. We really know that medication management and adverse drug events are absolutely critical and have been a high-focus area for everyone. Before we get started, we wanted to let you know that in the slide sets that you have available to you on SafetyLeaders.org that we're recommending that those who want to support Dr. Don Berwick's confirmation as the head of the Centers for Medicare & Medicaid could be supported. Everyone pays attention to the public, and in the first slide we've included Senator Chuck Grassley and Senator Max Baucus as folks [whom] you could send letters and e-mails to as well as telephone calls. And we'd encourage both phone calls and e-mail addresses. We at TMIT are taking, we always take an unpartisan [*sic*] approach to healthcare and focus on patients; however, we as TMIT fully endorse and support and give our highest recommendation that Dr. Berwick be appointed the head of CMS.

I'm Dr. Denham, Chairman of TMIT. I'll introduce each of the speakers with their short bios; but we have Dr. David Bates, Dr. Eric Poon, Dr. Tejal Gandhi, Ulrike Kreysa, Karl Gumpfer, and Dan Ford is our patient advocate who typically would start us off with an inspirational message but his flight has been delayed and he really is apologetic. He'll be coming on at the end of the session. Dan is one of eight members of a patient advocacy group at TMIT [who] are an advisory group [whom] we are helping become national spokespersons for patient safety. Dan is always eloquent and I know that he is representing that group. These are family members who have lost a loved one or had an adverse event and Dan believes, as all of us do, that the triad of engaged leaders, Safe Practices that deliver outcomes, and the enablement by technology, so the third of the triad is technology, it's the most powerful sweet spot or performance envelope that we could target – and really believes that this will be very important.

I'll keep my comments of what he would have said short – so that Dan can take a little longer in the close – and move forward to just address the mission of TMIT and those [whom] we engage to speak on behalf of the Safe Practices are that our focus is to accelerate performance solutions that save lives, save money, so save lives while saving money and building values, that is measurable value in the communities we serve and ventures we undertake. We really think that bar code is a critically important area.

My brief comments, because we have such a dynamite set of speakers, is [*sic*] just to refocus everyone on the 2010 National Quality Forum Safe Practices. Dr. Bates and the team from the Brigham have been a fabulous contributor, both to that and our GreenLight program, which is our impact calculator approach to all 34 of the Safe Practices. They were released on April 12th at the National Press Club by Dennis Quaid.

And with that introduction, I'd like to move to Dr. David Bates who actually needs no introduction. Dr. Bates is an international superstar in patient safety and as wonderful as his contribution is his humility about his contribution. He is the Chief of the Division of General Medicine and Medical Director of the Clinical and Quality Analysis at the Brigham and Women's Hospital, the Medical Director of the Clinical and Quality Analysis Information Systems for Partners in Boston. And the Brigham is a wonderful partner in our GreenLight program that focuses on the Safe Practices. Dr. Bates has also been a leader and co-author of the Safe Practice on CPOE. Dr. Bates?

David Bates: Chuck, thanks so much for that introduction, and it's great to have the opportunity to be with you today. I'm going to kick things off for our team, and I will be starting by providing a bit of an introduction to medication management broadly. And I will focus on the role of bar-coding for obvious reasons. And then Eric Poon from our group will tell you about the evidence for bar-coding, and we'll focus in particular on a major study that was just published in the *New England Journal* a few weeks ago. And then Tejal Gandhi will give you some clinical and operational implementation pearls for how to make this really work when you actually get around to doing it.

Medication safety is a complicated thing, and the typical hospital medication practice process has a number of stages. These include ordering. Typically the physician, but sometimes it is a PA or a nurse practitioner, orders medication. Orders are then, at least in the paper world, transcribed. And what that involves is having the nurse copy orders onto the paper medication administration records. Dispensing refers to the pharmacy actually choosing the medication and then sending it to the floor. In administration, the nurse gives the medication to the patient and documents that they [*sic*] did so on the electronic medication administration records. And then monitoring is done to assess whether or not the patient had the desired benefits of the drug or some adverse effect as a result of the drug. And when you look at a very detailed list of this, there are many other steps as well. But this is sort of a simplified framework. And the process is sufficiently complicated that medication errors in hospitals are quite common, and they can have serious consequences. And errors can really occur at any stage of the process, but they occur more often at some stages than others.

And here's a schematic, which basically describes the same thing: the physician is writing the order, then it goes down to the pharmacy where the pharmacist dispenses the drug. And here's some data which show what the proportion of errors were in each of these, at each of these stages, at least in one large study that we did. So ordering errors represented 49 percent of the errors. Dispensing errors were only 14 percent of errors, and I think part of the reason that that rate is as low as it is, is that pharmacies in general have actually worked a lot on reducing their error rates already. Transcription errors were 11 percent, administration errors 26 percent.

There are a number of different IT solutions that can be used to improve medication safety. Specific ones have their biggest impact at specific stages, which is not to say that order entry doesn't have impact at some other stages. So, for example, for ordering errors, CPOE is very powerful. For transcription errors, CPOE also makes a difference, and so does implementing the eMAR. For dispensing errors, key solutions include bar-coding and robotic dispensing, which is something that we won't be talking about today; but robots can be used to dispense solid forms with very high levels fidelity already today. And then administration errors can be prevented through bar-coding solutions, through the use of an electronic medication administration record, and also through the use of smart pumps. Smart pumps are particularly important for IV drugs, and that's another technology that we won't be discussing further today, but they have a great deal of potential to catch errors that nurses make before they get to the patient, and so they're especially applicable again for IV drugs.

I want to spend a couple of minutes on computer order entry. And this is where a lot of the work that I did has been focused. Order entry improves medication safety in a variety of ways. First of all, it streamlines and structures the process. When people pick a dose from a menu, they won't choose a dose that's ten times too high. You can decrease transcription. You can require complete orders. Many orders do not include a dose or a route or a frequency on paper; and this, with computer order entry, you can constrain the orders to include all those key things. You also can give people information at the time that they need it, so you can show relevant laboratory tests such as potassium levels, for example, for someone who's getting a loop diuretic. You can display guidelines. You can put in place guided-dose algorithms, which are tools that help someone dose a drug like heparin, which should be used in a very specific way. And then in addition, if you have CPOE in place, you can perform a number of checks in the background for things like drug allergies and drug interactions. It's not trivial, doing all of that well, and I won't discuss that further today, but it's essential to do it well if you want to get the benefits that you would like to see.

This next slide is an example of an allergy screen. Warning comes up, the drug that's being ordered is dicloxacillin; the patient has a possible allergy to penicillin, and they [*sic*] have a documented allergy to

cephalosporins, which is high. It's important where you set the default. Here, the default is set at canceling the order. It turns out that providers are pretty likely to accept whatever the default is, so you need to choose that carefully.

This next slide shows another example of a warning, in this instance for a high dose of doxorubicin, which is a chemotherapeutic drug; here, the warning says that the daily maximum dose limit for doxorubicin has been exceeded and the provider is asked to say whether or not they [*sic*] still want to proceed.

Computer order entry has a big impact on medication errors. Even a very simple implementation of computer order entry without a lot of fancy decision support reduced the serious medication error rate by 55 percent. Now this is from a study that we did that was published back in *JAMA* in 1998. Serious medication errors are the errors that either harm someone or have the potential to do so. In several studies that we did computer order entry reduced the overall medication error rate by over 80 percent. And the reason that that figure is higher is that most medication errors have relatively little potential for harm. It's actually easier to prevent the errors that have low potential for harm than it is to prevent the more serious medication errors. But ordering is not the only important stage of the process, in that many patients have been harmed by errors at the other stages of the process.

And in particular today, we're going to focus on dispensing and administration. And this came to the fore in a tragic incident in Indiana when three babies died, and the investigation showed that what had happened was that they'd gotten overly high doses of heparin. When a really careful examination was done, what was found was that there were two strengths of heparin in the pharmacy, and a pharmacy technician loaded a cart of medication that was going to the neonatal intensive care unit with an adult strength of heparin. And the nurse in the neonatal intensive care unit did not detect that it was a different strength of heparin, and gave that medication to several babies. This is the same error that occurred in the Dennis Quaid accident and has been described a number of times around the country. But this kind of error can be prevented, and we believe one of the key strategies for doing this is bar-coding.

The epidemiology of dispensing errors shows that dispensing errors are relatively common in hospital pharmacies, and that is in part because of the very high volume of medications that are dispensed. Now we, in our hospital, which has 735 beds, dispense about 6 million doses of medication per year, and we estimate that we have 44,000 errors per year. And many of these errors have the potential for harm. In the study that we did, we found more than 9,500 that had the potential to harm patients per year, and notably only a third of these serious errors were intercepted prior to administration. So this is a really big problem, and next I'm going to hand things back to Chuck, who will introduce Eric.

Charles Denham: Great. Thank you very much, Dave. Fabulous, and I know there'll be a number of questions that will arise, but great high-level overview. Terrific.

Eric Poon is the Director of Clinical Informatics, Associate Physician of Division of General Medicine and Primary Care at the Brigham, also an Assistant Professor of Medicine at Harvard, and will complement Dave's work. It's almost too hard to introduce the folks at the Brigham. They're all fantastic and wonderful contributors to the national scene of medication management. Eric, take it away.

Eric Poon: Well, thank you very much, and thank you to all of you who are able to join us today. And what I'd like to do for the next few minutes is to share with you some of the lessons we have learned at the Brigham and Women's Hospital in implementing bar-code scanning technology and to improve medication safety.

As all of you I'm sure know, bar-code technology is not new technology; it is ubiquitously used in the supermarket, but in healthcare, this is relatively new. Of course the VA Hospital has been using this technology since 1990, but the evidence that speaks to how effective it is at improving medication safety has been mixed until more recently. And of course at the same time, in the past few years, there have also been reports saying that the use of technology, such as bar-code scanning technology, if it's not implemented correctly, could lull folks into a false sense of security and could actually increase the incidence of errors. So, here at the Brigham and Women's Hospital, when we embarked on the project to

implement this technology about eight years ago, we decided it was important to actually capture the impact of this technology, be it good or bad, on patient safety. And I'd like to share with the folks on the webinar today some of the results.

And the first place we started was in the pharmacy. We know that at our hospital, which is a tertiary academic medical hospital, we dispense about 6 million doses of medications per year. And as David was alluding to, if an error is introduced at the dispensing stage and the wrong medication is sent up to the floors and the wrong medication is being put into the medication cabinet, it can actually lead to downstream errors. And therefore, our hospital leaders decided to invest in bar-code medication verification technology, first at the pharmacy. And at a high level, the way this technology worked was that at the point of medication picking by the pharmacy technician, the pharmacy technician would be asked to scan the medications they have *[sic]* picked from the walls, off the shelves, and the thing is being made at the picking stage, the pharmacy technician will be stopped in his or her tracks and cannot proceed until the right medication is being scanned. And with this relatively simple step, we actually felt fairly dramatic reductions in the number of dispensing errors. We detected these dispensing errors by introducing a research pharmacist, and these research pharmacists would actually visually inspect medications as they were finishing the normal dispensing process, and the research pharmacist would look at the medications about to be sent from the pharmacy to the floor to look for possible errors.

And as you can see from the graph on Slide 27, we found that with the introduction of this technology, we were able to cut down dispensing errors by 31 percent. It is important to note that this did not completely eliminate dispensing errors. Some of these errors revolved around the wrong quantity amount of medications being picked or being dispensed, and bar-code technology is not as good at catching those errors. But when we looked at the subset of dispensing errors that have the potential to harm patients – we call them the potential adverse drug event – we actually saw a 63 percent relatively reduction in the incidents of potential adverse drug events at the dispensing stage.

So what do these numbers really mean for us? At the Brigham and Women's Hospital, where we dispense about 6 million doses of medications, these reduction in error rates translate to more than 13,500 medication dispensing errors, of which more than 6,000 actually have the potential to harm patients. So it's easy to see that, even with a relatively simple intervention at the point of pharmacy, one can have a pretty significant impact. And if you want to drill down in terms of the number, the types of dispensing errors that we were able to avoid, we actually saw quite dramatic reductions in the incidence of wrong medication errors or errors associated with a wrong dose, a wrong strength, a wrong form being dispensed from the pharmacy.

But of course, this technology wasn't cheap; and as we were implementing this technology; we thought it would be important for us not to only capture the benefits of this technology, but to also see whether the cost of the technology could be justified by the benefits. And that's why we actually conducted a formal cost benefit analysis around the deployment of bar-code technology in the pharmacy. And in order to conduct the study, we looked at the number of errors that we were preventing by introducing bar-code scanning technology in the pharmacy and extrapolated that to the entire hospital's operation. And then we also took a very careful look at the investment we made in building the software, buying the hardware, and we also looked at any staffing changes that were associated with the deployment of this technology. One of the key things we had to introduce was to make sure that each medication had a bar code on it and because, when we implemented this technology, the FDA ruling had not come in place mandating bar codes to be present at every unit dose, our hospital actually had to invest in a separate repackaging center to make sure that every single medication that was dispensed from our pharmacy would have a bar code on it at the unit dose so that a pharmacy technician can actually scan it at the point of dispensing.

And when we actually looked at the total cost and weighed that against the total benefits of preventing errors, we actually projected that over a five-year period, this technology alone was saving our hospital more than \$3 million, starting from the point of project initiation; and that was a very encouraging number for us. And of course, in some ways, Dave's work has actually paved the way for this kind of result. His study showed that every incidence of preventable adverse drug event actually cost the hospital an

additional \$4,500 to \$4,600 per episode; and when you're preventing that many errors at the dispensing stage, the cost benefits really do add up.

So let me move on from talking about bar-code technology at the hospital pharmacy to bar-code scanning at the bedside. We knew that, in order to really leverage the technology, we had to introduce it at the bedside, so that nurses at the point of medication administration would actually scan the medication bar code to make sure that the right drug is being given to the right patient at the right time. And of course, in order to make this happen, we really had to do a lot of work in linking together our CPOE system with our pharmacy system. And those two systems would eventually drive electronic medication administration record system, or eMAR system. And with the introduction of our electronic medication administration record, we actually eliminated the transcription. Before we had this technology, our orders that were written electronically by our physicians and physician extenders had to be hand-copied onto paper med sheets by either the unit secretaries or the nurses; and it's easy to see how that transcription step would have introduced a lot of errors, and we eliminated that step. And we'll also talk about, in a few minutes, what was the impact of that. And of course, we did a lot of workflow redesign to enable the nurses to use this new technology successfully; and Tejal will talk a little bit more, after my segment, about some of the practical lessons we have learned along the way in making sure that this technology would be successful.

So this next slide briefly talks about how this technology would appear to the clinical nurse. On the left-hand side of the screen is a screenshot of an electronic medication administration record. And the way we actually make this work for our nurses is that we actually supply each nurse at the Brigham with his or her own computer work station on wheels, and on this laptop computer we actually show them this electronic application. And this eMAR application would show the nurse whether any of the patients [whom] he or she is taking care of has medications that are due or overdue. And when the nurse goes down into that patient's record, he or she can find out what medications need to be administered. And if the nurse decides that the medication needs to be administered, the nurse will actually retrieve the medications from the storage areas on the patient care areas, scan the bar code on the medication, and on the top right-hand side of the screen you see a data metrics bar code on one of our medications. And the nurse would then use the wireless scanner that is covered to the computer on wheels through Bluetooth; and the scanner will first be used to scan the bar code that is on the patient's wristband, and you can see a picture of the bar code on the patient's wristband at the bottom right-hand side of the screen. After that, the nurse would scan the bar code on his or her work badge as a way to document that this medication is being given by that particular nurse. And of course, in the scanning process, if the computer detects an error, the computer would not allow the nurse to proceed; and here on this particular screen, I'm showing you the warning that the nurse would see if the nurse is trying to give the wrong medication to the patient. So – and when I say “wrong medication,” it could be a wrong medication altogether, or it may be the wrong form or strength of the medication.

On this screen, I'm showing you what the nurse would see if the nurse is trying to administer a medication that is not on the patient's medication profile at all, in which case a wrong patient warning would come up, and the nurse again would not be able to proceed. And obviously, in implementing this technology we knew from some of our colleagues around the country that if the nurse did not accept this new technology and bypassed the scanning step, the technology really would not have its intended effect of preventing medication errors at the point of administration. And that's why we decided to actually look at the impact of this technology in a very rigorous way. There have been some studies, before we did ours, looking at the incidents of errors as reported from my nurses and those studies did suggest strongly that there would be a reduction in the number of errors. However, we all know that busy clinicians may have a hard time reporting all the errors that he or she might detect, and that's why we thought that, in order to really answer more definitively the question of whether this technology would reduce errors, we need to use direct observation techniques. And we have, in doing that, we worked with Dr. Ken Barker in Alabama to define a methodology for our research nurses to shadow our clinical nurses, and our research nurses would record all the medications that are being administered to patients. And after those direct observation sessions, those research nurses, in conjunction with our research pharmacists, would look at the list of medications that were actually administered to the patient and compare that with what was supposed to be given to the patient to detect any administration errors. And after that, all the errors that were uncovered during the reconciliation process were further adjudicated by a multidisciplinary panel to

confirm whether an error actually did take place, and if an error did take place, we would try to classify whether it had the potential to harm patients. And the subset of errors that had the potential to harm patients were classified as potential adverse drug events.

And this is what we found: on units that had not implemented bar-code scanning technology, we found a medication administration error rate of 11.5 percent. Within six weeks of implementing this technology, we did the measurement again and we found that the incidence of medication administration errors after the implementation of bar-code scanning technology went down to 6.8 percent, representing a relative reduction of 41 percent. And then we focused on the subset of medication administration errors that actually had the potential to harm patients; these are the potential adverse drug events. The incidence of these potential ADEs went down from 3.1 percent to 1.6 percent, corresponding to a relative reduction of 50.8 percent.

In looking at the various types of potential adverse drug events that we were able to prevent, we found that this technology was able to have a significant impact on potential adverse drug events that were both significant and serious. Significant potential adverse drug events are typically adverse drug events that result in increased patient discomfort, such as increased pain or nausea, whereas potential adverse drug events are serious referred-to events where a patient might have ischemia that is uncontrolled, or seizures that may not be controlled. And in both cases we found about a 50 percent reduction in the incidence of potential adverse drug events. There were very few life-threatening potential adverse drug events that we detected, so we couldn't say anything definitive about that very small subset.

And in doing the study, we were also careful in monitoring the impact of this technology on transcription errors. As I mentioned earlier, we did eliminate this step, and we did a study before we rolled out this technology; and we found that, for every 100 orders that were transcribed manually, either by unit secretaries or nurses, we found more than six transcription errors. And of these six transcription errors, about three of them had the potential to harm patients. And with the deployment of bar-code scanning technology we eliminated the transcription step; and not surprisingly, when we went back to look at our electronic medication administration record, we did not see any errors associated with transcription.

So in conclusion, I think bar-code scanning technology, both at the point of pharmacy dispensing and medication administration at the bedside, has significant potential to reduce errors and some of the more serious errors that can harm a patient. And in extrapolating some of our findings back to the study hospital that dispenses about 6 million doses of medications a year, we are projecting that this technology at the Brigham and Women's Hospital is preventing 90,000 potential adverse drug events at the administration stage, and in addition we're preventing about 50,000 potential adverse drug events at the transcription stage.

So that's the good news of the study. However, as you probably have seen, we were not able to eliminate all the errors at the dispensing or administration stages. And in looking back at our study findings, we know that when we did our measurement, which was very early on after the roll-out, many of our clinicians were still on the fairly steep portion of the learning curve; and we knew that compliance to medication scanning was not at 100 percent – it was actually more at the 80 percent range. And we've also listened very closely, since we rolled out the technology, to our clinicians; and they kept telling us about things that we could do better, in terms of redesigning the clinical processes and tweaking our software to make sure that it is as safe as possible.

And one more of the lessons that we have learned is that, when you roll out this technology, you are not done. You really need to learn from the front-line clinicians to make sure that you can incorporate their suggestions into new versions of the software and new ways of doing things. And when we started rolling out the technology, we knew that folks did not just care about errors – although of course that was a big part of it – there was a lot of concern about whether this technology would make the nurse feel less connected to their professional roles in the medication-use process. And that's why, along the way, we actually conducted satisfaction surveys, both before and after the roll-out of this technology. And I'm happy to report that, at the Brigham, the nurses really felt that the new technology made the process safer and more efficient.

And one of the other concerns, as we rolled out the technology, was that our clinicians, particularly our nurses, are very busy; and if they had to spend a significantly bigger chunk of their time dealing with medications, patient care might suffer overall and I don't think they would be very happy. And that's why we actually did a series of very careful measurements. We actually did some direct observations both before and after the introduction of this technology and were happy to find that through the introduction of this technology the proportion of time that nurses spent with medication administration actually did not change significantly, actually went down from 26 percent to 24 percent, although that actually did not reach statistical significance. And we knew that, for some parts of the workflow, they actually had to spend more time. For example, before we had this technology, nurses were not consistently looking at the patient wristbands before they gave the medications to the patients; and now with this technology, they had to. So there is an extra step introduced, and that actually did take more time. And of course, scanning all the medications also did take time as well. But we were able to compensate for that by reorganizing the nurses' workflow. I think having a computer on wheels made it much easier for nurses to organize their workflow so that they do not have to walk back and forth to the computers that are in the central patient-care areas and to the medication storage areas on the patient-care units.

So all in all, I think we improved part of the workflow to compensate for some of the extra steps that they had to take. And when we drilled down into the workflow data, we actually found that nurses ended up spending more time in front of the patients; and that could only be a good thing – to help patients feel that the providers are working around them to make sure that the care is as coordinated and as safely delivered as possible.

So to summarize some of our findings, once again I'm showing the slide that Dave showed earlier documenting the various stages where errors can happen in the medication-use process. And as Dave alluded to, CPOE reduced the incidence of ordering errors by about 49 percent; and our more recent studies show that the 14 percent of serious dispensing errors actually would have gone down by 67 percent with the introduction of bar-code scanning in the pharmacy. And we eliminated transcription errors and we cut the incidence of serious administration errors by more than 50 percent. So with that summary, I'm going to turn the baton over to Dr. Tejal Gandhi, who's going to talk to us about the clinical and operational pearls of the technology.

Charles Denham: Great, and Dr. Gandhi will, formerly at the Brigham, is now responsible across Partners HealthCare System for patient safety, which is a big job but also a great job, and a wonderful opportunity now to work across the entire system. Please go ahead.

Tejal Gandhi: Thank you, Chuck. So I'm going to be talking about some of the clinical and operational pearls that we've learned as we've implemented bar-code scanning; and I know there's a lot of questions coming over the Q & A, that hopefully some of them will get addressed by this part of the talk. I also want to thank Anne Bane at Brigham and Women's for a lot of the slides that I'm going to use. She was the nurse who was the main implementer of the system.

So just some components to our implementation. So our bar-coding eMAR software was developed by Partners HealthCare Information Systems. It was customized to Brigham and Women's medication administration, with the ability to provide real-time enhancements and it really was – including the pharmacy piece, the roll-out to the med-surg areas, the development, etc. – it's really been a ten-year project for a long period of time. We did an initial pilot back in March 2004 in an intermediate care unit and an intensive care unit, and had various support for training of the nurses that were done both for the pilot and then for the eventual roll-out, which included computer-based training for our classes for the floor nurses, we had nurse super-users and IS analysts who were available as well. And I will talk about that in a little more detail.

After that initial pilot, there were numerous enhancements made to the software prior to incremental hospital-wide roll-out. And it was an incremental hospital-wide roll-out, we didn't do the whole med-surg hospital in one fell swoop, but we did it over a period of several months; and that included three mother-baby units, 27 intermediate care units, and eight ICUs. In a second phase that just recently went up, we

also added hematology-oncology units, and planned are some specialty units such as the ones listed, and also our neonatal intensive care units.

So during the roll-out we had super-users, who were actually experienced nurses who underwent super-user training and they were available to all staff nurses to assist with medication administration until proficient, and were essentially available 24/7 for the staff nurses. And actually, just going back to that point, Eric mentioned we did the cost-benefit analysis: one of the biggest costs to implementation of this system was the training piece for all of our nurses and these super-users. The training was a big component of the costs. We also had information systems analysts who were also available 24/7 to troubleshoot issues with the application and hardware, and act as a resource for the super-users. A lot of time was spent on hardware selection, so especially when we were doing our pilots on the med-surg unit and the ICU, and we looked at various computer options, including having a laptop versus even a hand-held device type of thing, wall-mounted devices versus mobile units on carts. We looked at the carts themselves in terms of how big they were. We looked at the scanners, did we want to tether them or have them be untethered? And there were infection control issues, and obviously issues in the longer term around maintenance and support of hardware.

We realized, especially in our hospital which does not have a lot of space, that we needed a small footprint for this whole device, and we also learned that the eMAR cart was going to be a workbench for the nurses, and so we had to make, we learned that the initial carts that were selected really had no writing surface, and beverages and computers don't mix well. Many issues where, again, as you can see in the picture, many things are right next to that computer; so trying to select equipment that would accommodate these kinds of issues. So the pilot was very helpful in learning about these issues that came up.

Scanners. We needed scanning flexibility at the bedside. We wanted scanners that fit the workflow, that were light and easy to use, allowed proximity to the patients. We went with untethered scanners for that reason. The problem with that is you can put them down anywhere, drop them anywhere, and they can easily be lost. After the pilot, there were some changes that were made, such as improving the design of that, the computer on wheels to have some space for documentation, to have more protection for the laptop, the covers for scanners were added that are protective covers to help in case they hit the floor.

So I think the lesson here was really that there's so many different hardware options in having the end-users participate in selection is really critical in doing these kinds of pilots are really critical to pick what's going to work well in your system.

So what else have we discovered since implementing eMAR? So one issue is that the late medication cue – so we have a cue that prompts nurses that medications may be late, and that actually has made medication administration a higher priority, which is good; but because of some of the fear of consequences related to late medication administration, there were often some changes of medication schedules that perhaps were not appropriate but were done to make sure that people didn't get sort of a documented late medication administration. So some solutions that happened within our nursing department was [*sic*] to re-emphasize of course the message that prioritized care, care prioritization should be based on patient needs and not the computer. The icons are only prompts, and we had done a very large campaign around the fact that no one was going to look at this kind of data in a punitive way, so there was not going to be any consequence of having a high rate of late medication administrations. And then we reviewed the definition of a late medication administration with the nurses and also allowed them to enter reasons that the medication administration was late so that we could potentially improve our systems to reduce those rates.

In terms of medication scheduling, standard administration times were really key, and we learned, as we were designing the system, that we really didn't have standard administration time, so that was something that we had to implement across the whole hospital. And there was just a lot of work done to improve the scheduling system of medication, both at the pharmacy level and at the nursing level, to have standard administration times but also allow the nurse to fit the schedule to provide the best patient care. So we

needed standardization with some flexibility; and a lot of work went into tweaking the system that we had to make it work better.

You know, this is an issue that I think everyone will face, which is bar-coding inconsistencies. The nurses had a lot of issues of “where is the bar code,” “which one do I scan,” “why won't it scan,” etc. Some of the solutions that we had were to try to standardize the display of the bar code as much as possible and also managing our own database of bar codes in our system.

Physician workflow also was an important issue, and physicians initially complained once the paper MAR disappeared. Now they were spending a lot of time wandering the units looking for that piece of paper; but then when the paper disappeared initially, they were having a hard time getting access to computers to actually find the medication administration data. So some solutions for this were having some dedicated devices for physicians that they actually could use while rounding. Having different hardware solutions for different disciplines, also different screen displays for different disciplines, improving log-on times, and, as I mentioned, having some user-friendly screens.

There was definitely an impact in the pharmacy. There was a change in workload in the pharmacy department. We required that the order be approved before the nurses could electronically take it off for the MAR. They had to do a lot of work with the scheduling piece, as well as troubleshooting ordering issues, and so there was definitely an impact on pharmacy workload; though I think both pharmacy and nursing felt that there was increased and better communication with the use of this system.

There's always a concern that technology leads to an over-reliance on technology; that “the computer told me to give the meds,” “the eMAR set me up to make the mistake,” these kind of comments. Can it replace critical thinking skills which CPOE, also, people have that concern about? People also expect the application and equipment to be perfect and potential for a weakening vigilance; so we never really want to rely on vigilance anyway in terms of a safety solution.

But when we rolled it out, and after roll-out, we really had to emphasize that the technology was intended to double-check the clinician. We often shared stories with the clinicians about how it was working well, but also times when people perhaps didn't use it appropriately and problems occurred, so sharing stories was really important.

We avoided over-engineering, tried to keep it simple, and just make it easy to do the right thing. And a big piece, as well, was continually seeking user feedback for improvements. Our nursing department – Anne Bane, [whom] I mentioned, did a great job of being very visible on the unit every day and asking people what was working well, what wasn't working well, and doing that in a face-to-face way. And in addition, we had a very easy button on the eMAR application where people could provide feedback about issues that were going on. So that feedback piece was really important, especially the early stages; but even now they continue to do that kind of work because there's always improvements and enhancements that can be made.

So, things we wish we had known: order entry, if order entry isn't being used well, a lot of those issues will surface when you get downstream into pharmacy systems and eMAR systems. The quality of bar codes can be an issue. Scanning skills. Scanning is an art, is what we learned. It's not necessarily that every person can pick up a scanner and do it right away, and so there was actually a lot of time that needed to be spent on developing good scanning skills. And then there's a huge variety of workflow practices in each specialty area, within each specialty area; so a lot of work needs to be done before implementation on understanding the workflow.

This is just an example of what we call a good bar code and a bad bar code; and it's actually a pretty subtle difference that this subtle difference can make a big difference in terms of the ability for a nurse to scan a medication.

So some of the eMAR lessons that we learned: training is most successful when clinicians teach clinicians; the super-user model that we used, with experienced nurses being the super-users was really

very well received. You always have to expect extreme variances and staff acceptance. As everyone knows, I think the major thing that we did at the Brigham around this technology was that we never promised or said that it was gonna make things faster, that it was gonna make things easier per se. We always said we're doing this for safety, so we set that expectation from the beginning, that this is about safety; it's not about making things faster.

You always need to be ready to uncover unknown processes that have been supporting the existing medication administration system. You know, we just discovered a lot of little loopholes and work-rounds that people were doing; and when we implemented eMAR we had to know about all of those to make sure that we kind of accommodated for those or fixed those in the new process. Staff need to be involved in equipment decisions, and the medical staff as well had to be engaged for training and for screen design.

Best practice needs to drive technology, and clearly paying attention to the human technology interaction is really important. When we first started out, we thought every nurse would want a handheld device because it would be easy to carry around and they wouldn't want to be pushing this cart around, and we were completely wrong. So it's just really important to understand the human-technology interaction and what the users want. Technology can never replace critical thinking, and user feedback is essential, as I've mentioned; and also, as I've mentioned, the work really never ends. Even in our CPOE system, which has been up for 16 years, we continue to make improvements. eMAR's been up for five or six years and we continue to make improvements; so it's not one and you're done.

So just to wrap up from Eric and my talk combined, so we've learned that bar-code technology significantly reduces dispensing, transcription, and administration errors. The benefits of the technology outweigh its costs in the hospital pharmacy, and we're actually working on a similar cost-benefit analysis for the bedside bar-coding piece. A well-designed and fully supported system does not increase the proportion of time nurses spend on medication administration, based on our time-motion studies, and the technology does not appear to compromise the amount of time nurses spend with patients. And I'll just say one last time, yet again, the key is the involvement of end-users from the beginning in the design, hardware selection, and piloting. And with that I will pass it back to you, Chuck.

Charles Denham: Wonderful. Those pearls are terrific, and the combination of the three of you presenting really provides such a rich knowledge base. Thank you. The pearls are absolutely terrific and they really build on each one of the building blocks you shared with us.

Now we would like to move on and have a short presentation from Ulrike Kreysa. She is the Vice President of Healthcare for GS1 Global Office in Brussels, Belgium. It's later there in Brussels. We're really honored that she stayed up to help us today. We had planned for her to be a speaker at our Global Patient Safety Summit that was in Nice, France; and the volcanic ash may have kept us from getting to Nice, but it hasn't kept us from having her speak to us about harmonization of the technology standards. Ulrike, please take it away.

Ulrike Kreysa: Thank you very much for the introduction. And I would like to tell everybody why it's important to have really global standards for patient safety. And I take a really simple example, which I think everybody knows from your daily lives. When you are traveling, you have the trouble with having the right connector for electric tools; or if you are going to buy shoes, you see that it's very different in the different countries, which doesn't make the life easy. And if you don't speak the same language, then you really have complications, and you have errors, and that's why really we need global standards. In retail there's a lot of questions; we have global standards that are confused, and everybody of you on the phone is using different standards when you are going shopping, in your daily business, and in your shopping mall or in your supermarkets. We have more than 6 billion beeps per day in that environment. In retail, there's no question on global standards. Unfortunately, in healthcare, that's not the case. If you look around in hospitals – and I have worked long in hospitals also – in hospitals if we don't have bar codes which are only present yet and very often we need to create them therefore.

That's the situation on the next slide, which it's a real life example from a Belgian hospital, which I found there. It's a French manufacturer, who's trying really to accommodate all the different requirements coming from different sites in Europe and putting all of them on one package. If you are a nurse and you should scan, this is a very unsafe product, because you just don't know which one to scan, so patient safety definitely is not achieved here; also, this product is bar-coded.

On the other side, you must really see that, for the manufacturer, it's a headache, really, if you have requirements from different countries, and everybody's requesting different things from you as a bar code. And this can be, as well, a regulatory body like the FDA, where your big commissions can also be a big group purchasing organization who have their own ideas what they want to see as a bar code on the product. As the supply chain today is very global and manufacturers are not producing any more one product in one country for that country, but they are producing in one country and then they are shipping across the world, it is important that we have a standardized approach to that; because only with that, really, manufacturers will go along and put bar codes and automatic identification on packaging. And otherwise, we will see further and we will need to re-label and re-package as it is done today by Brigham and Women *[sic]* in a very great way, but we need to have bar codes for that site scanning, for patient safety. But as bar codes in a hospital is additional costs, additional work, and at the end it can also be a source for errors. So definitely to have source-marked products, so products which are source-marked by the manufacturers would be the ideal situation, and we are striving to help this situation.

So that's what really if we would have liked in, on every product in the retail sector, a GTIN, a global trade item number, on each package, which would allow us really unit identification for each product while it's going through the supply chain. So from the manufacturer who is assigning the GTIN and then this GTIN allows everybody to follow the product through the supply chain until it is supplied at the patient's bedside. GTINs and product identification also enables traceability, really, from the production down to the bedside and to the patient, and that's important if you look at regulatory requirements and traceability, if you look at track forwards or trace backwards, it's a very important requirement today.

That's the reason why, a good five years ago now, we have created a Global Healthcare User Group, which is comprised by stakeholders from across the world and from all kind of stakeholders. So hospitals, distributors, manufacturers, associations, regulatory bodies, they all have come together to discuss and develop global standards with the goal and the objective to enhance patient safety. And we are sure that with enhancing patient safety, we will also enhance supply chain efficiency; and that's something which I think is also needed in healthcare.

This shows you the corporate members of the Global User Group; and you can see it's comprised as well by U.S. trade companies, by European companies, and even Asian companies, but also as well pharmaceutical big companies as medical device companies. Because while we are talking here about the pharmaceutical part of it, identification is getting very important also in medical devices; and we will need also to have better unit identification of product.

On the next slide, we show a little bit of what's going on in the world, some examples from across the globe. Touching on the first one, that's an announcement and activity taking place in Canada, and very recently the Institute for Safe Medication Practices of Canada and the Canadian Patient Safety Institute have, after really more than a year of consultation, endorsed the adoption of different standards for automatic identification of pharmaceutical products in Canada. And they are moving forward to promote and to educate hospitals across Canada on the usage and how to best use those bar codes to ensure patient safety. The New Zealand Medication Safety Project actually is a consequence of the work which has been done, on the one hand side at Brigham and Women's, and on the other side, a very unfortunately accident which happened in New Zealand when a patient died due to medication error. Actually, the Minister of Health of New Zealand came to one of our global conferences and heard the speaker from Brigham and Women's talk about the work they are doing there, has visited the Brigham and Women's, saw what they are doing; and as a consequence, the ministry has decided to put a project on and has provided a large amount *[sic]* of scholars to introduce that type *[of]* scanning in New Zealand in each hospital.

The next one which is mentioned is the European Association of Hospital Pharmacists in Europe, which is requesting unit doses and bar-code scanning, which they feel is needed for hospitals in Europe everywhere. In the U.K., Coding for Success was a project which was launched and initiated by the Department of Health, which is the Ministry of Health in the U.K. And they have published a document which is called Coding for Success and describing why you should use bar-code and automatic identification, and have asked all hospitals in the UK to follow standards and implement standards. I must say in the meantime, in the last few years, a lot of work has been done there, and over 200 hospitals are working on really introducing standards, and introducing different standards, for example also for robotic dispensing. In the U.S. you might be aware that the major GPOs have set sunrise dates, so they have requested that until end of 2010, everybody's using this so-called GLN, global location number, for the identification of hospital places in all electronic communications. And at the end of 2012, every supplier should use these GTIN, the global trade item number. And last but not least *[sic]*, an example from Brazil, where I was very impressed with what the hospitals in Brazil are doing with regards to using bedside scanning and the same kind of work that Brigham and Women's is doing: while bar-coding product and scanning them at the bedside and reducing medication errors, there are really a lot of hospitals in Brazil already working on that. So you can really see, work is going on across the world.

And what I would really invite everybody who's working activity in a hospital, invest in automatic identification and traceability systems. There is a strong need to do so and it's not easy. I think you have heard from speakers before me that it requests some time, but it's really worthwhile to do so on the economic side, but much more really on the side of saving patient lives. And while you do so, you should base yourself on global standards with that. And I would invite you to join one of the user groups; we have a local user group in the U.S., a big one is One Healthcare U.S. We have also the Global User Group and work together with other stakeholders and supply chains with the objective to save patient lives and improve patient safety worldwide. Thank you very much for your attention.

Charles Denham: Thank you very much and we were delighted to have the input from Ulrike and their group as we headed to our Global Patient Safety Summit; and as we head towards the end of these sessions with this group, we're excited about bringing forth to the National Quality Forum a bar code Safe Practice and do so in a manner that would really harmonize across the globe so that we don't miss the great opportunities that we might have to collaborate with these organizations.

I'd like to also introduce Karl Gumper, who will share with us some of the thoughts regarding the tools that may be available with ASHP.

Karl Gumper: Sure, thanks, Chuck. I just wanted to let everyone know to check the SafetyLeaders.org webpage and ASHP has made available some of our resources (at http://www.safetyleaders.org/webinars/indexWebinar_June2010.jsp). There is a toolkit for bar-code implementation that was done by the ASHP Foundation a couple years ago that has some useful tools about different equipment and things to consider if you're implementing bar-coding. We also have some policy position statements on information technology related to automation, CPOE, and where we see pharmacists on what they should be doing in these areas. Recently, we've had two statements on bar-coding: one looking at bar-code administration that's been available for the past two years, and the second one is bar code during inventory preparation and dispensing of medication. That's really hot off the presses. It was just approved by our House of Delegates at our meeting last week, and that goes into a lot of the detail of implementing a bar-code check system within the pharmacy. Also, we've included the ASHP statement on the role of the pharmacist and informatics, in case we have anyone out there interested in getting more involved in informatics.

The other thing I just wanted to point out was that ASHP does an annual survey every year, and we're always looking at different areas of the medication-use process. And we always ask about different technologies that have been adopted by our hospitals around the country. And this survey typically goes out to about 1,300 or 1,400 directors of pharmacy, mainly general, med-surg, and free-standing children's hospitals. In the 2009 survey, it was found that 27.9 – or we could say 28 – percent of hospitals have implemented bar-code technology on administration. We've been tracking this since 2002, where the adoption was about 1.5 percent, so over the past eight years we've had significant implementation of

these systems. In our 2007 survey that we did just on technology, we've asked a lot of questions related to how the bar-coding system works and what some of the problems could be. We've asked about outsourcing of medications where the hospital pharmacy will have a re-packager or re-labeler take care of that piece of the puzzle, and about 11 percent of the hospitals actually did that. And we also asked about, "Do you have repackaging equipment in your hospital pharmacy to do this to support your bar-code system or your robotic system or whatever it might be?" And not too surprisingly, the pharmacist, it's probably about 92 percent of the hospitals actually have that available. We also asked about what percent of medication actually need to be relabeled in order to support either a robot or a bar-code medication administration system; and unfortunately about 40 percent of medication products actually need to be relabeled because either the bar code is insufficient, or there might be other readability issues. And then we also asked, related to the FTE requirements, to support this type of process. And on average it was about 0.8 of an FTE to help maintain the relabeling of the medications to support the bar-code and robotic systems. So I just wanted to point out a couple of those findings from that 2007 survey and I'm going to turn it back over to Dr. Denham now.

Charles Denham: Great. And I think what we'll do is we'll walk through each one of our speakers because we have had some questions pop up on our Q & A grid; and then when we come to Ulrike, we'll ask Jan Denecker to also make comments.

But I'd like to come back to Dr. David Bates first; and David, there were some questions that popped up that you may want to answer, as well as ...and then we'll go to Eric and go right through the list. But my first question to you, David, is that we've discussed the cost of an adverse drug event, I just want to put a fine edge on adverse drug event, whether you all are using the NCC MERP classification and the 2010 dollars of cost of \$8,250 was an approximate cost for an ADE. Is that a cost to the hospital, or is that a cost to the hospital and payer? And what would the breakdown be if we were to go into our own C-Suite at Saint Elsewhere Hospital and say we really need to adopt bar code? I heard this wonderful webinar from some great experts, and there's a certain cost benefit of this, putting aside that the harm, death, disability, and other problems, but then also the pitch to the payer. What is the fully loaded cost of adverse drug events, and how should we define an ADE, and perhaps use the NCC MERP classification?

David Bates: Sure. So, that is essentially the fully loaded cost of an adverse drug event. Obviously there's been a lot of inflation since the study that Eric referenced was published. We're actually in the process of looking at that again, now, and it will be very interesting to see whether it changed. And we're going to be looking in some community hospitals, which are quite a bit different than the academic hospitals that this was worked out in previously. But my sense is that the cost is going to be relatively similar. Now we did not use the NCC MERP classification – and I'm actually not a major fan of the NCC MERP classification, because I think it conflates errors that actually hurt people and adverse drug events, but it turns out you can map to that. And the things that scores [*sic*] adverse drug events in NCC MERP classification do count as the adverse drug events that we were looking at. Those costs are to the hospital, you know exactly how – some of the costs do end up going to the payer, too, and exactly how that parses out depends on how the individual hospital is paid, but most of the costs do go directly to the hospital. And in the future more of them will go to the hospital because hospitals are not going to be paid for harm that they cause, which is a good thing because it will give them a financial incentive to try and prevent these events.

Charles Denham: So how much, and then we'll move on, but of the \$8,250, direct versus indirect cost, and what would you guess that would be to the hospital today, with our current reimbursement system?

David Bates: It's probably in the \$6,000 to \$7,000 range to the hospital for most institutions, assuming an average sort of payer mix.

Charles Denham: And would we, do you think that that would be an avoidable cost, or probably attributable?

David Bates: Yes.

Charles Denham: That would avoidable?

David Bates: That's an avoidable cost –

Charles Denham: Yep.

David Bates: – and most of the analyses that we do suggest that the kinds of prevention approaches that Eric presented are not really that sensitive to the cost of the adverse drug event. So even if it ends up being \$3,000, which is, I'm confident, less than it really is, these interventions end up looking pretty good from the cost-benefit perspective.

Charles Denham: Exactly. Wonderful. Eric, are there questions that popped in the Q & A window that you would like to answer before we ask some of you?

Eric Poon: Let's see, so, I think there were some questions about what were some of the errors that still remain after we rolled out the technology, and I'll take a stab at that question. I think Tejal would have a lot to add as well. I think that, as I alluded to in some of my typed answers, our scanning compliance was not perfect. It was, it hovered around 80 percent for quite a while, and it's still not perfect today. And I think that, when scanning is imperfect, one could expect that there would still be some residual errors.

I think another area of errors that we saw early on was around the first dose of medication after an order is written, particularly around the time of transition from the emergency room to the med-surg unit. And I think that what we've had to do more recently is to really provide the pharmacist and the nurses a new set of tools to make sure that they know who is responsible for scheduling the first dose of medications, and then the computer will be smart enough in detecting errors that could be made that way. So that was a significant piece of work that we've had to do. I think that when medications were hard to scan, particularly around the IV bags, I think users, the clinicians would get to be frustrated, and that's something that we've had to work on quite a bit. Tejal, do you have anything to add?

Tejal Gandhi: No, I think the only thing I would add is that there were some errors that were happening before bar-coding that certainly didn't go away after bar-coding, so, for example, if – I think there was a question about – if a physician ordered a wrong drug from the start, there's no way that the bar-coding would necessarily catch something like that. Also, we have issues – and this was in the paper world as well as our electronic world – in transitions of care; so if the patient's coming from the ED to the floor – sometimes it's unclear if they [*sic*] got an antibiotic in the ED, so they might get it again, but that's more of a transition issue – and once all of our areas are on eMAR, including the ED, hopefully that will get better. And then I think our next area of interest actually – David alluded to this – is really around pump programming errors, because those now seem to be our biggest source of error is, everything's right until the nurse gets to the pump and then makes a manual programming error. So smart pumps and things like that can help with those kinds of issues, and even ultimately automatically programming pumps wirelessly or with bar codes are sort of, I think, where we're headed to try to get some of those errors. So there's [*sic*] some things that, as I said, were around before and bar-coding certainly hasn't addressed.

Charles Denham: Wonderful, and as many of our hospitals that are in this, in our research tests bed, and we have hovered around 500 lines and typically we have 3½ to 4 people per line, we have many hospitals that are contemplating adopting bar-code technology and may not have the rich support staff that you might have for training. And to address as, Tejal, you discussed, critically important to have the caregivers involved from the beginning to the end. You know if we looked at it either dollar per dollar or time, frequently we say, when we're adopting technologies like this, that there might be [an] equal dollar that we need to spend in soft money and in light green dollars for every dark green dollar we spend on bar code. Can you give us a feel for what you think a front-line community hospital might need to allocate in terms of staff time to do it right, taking your pearls into consideration?

Tejal Gandhi: Well, that is a tough question. The only thing I'll say, and I think Eric probably even has a, I mean if you look at cost, at least, as I mentioned the costs were significantly more for the training piece than for the actual software-hardware piece, which was not what our expectation was initially. But having

super-users available 24/7 and they didn't have other clinical responsibilities at the time so their time needed to be back-filled with other nurses and they needed to get paid and so on and so forth. So that was definitely the biggest cost. You know, I don't have a sense of how many FTEs we're talking about in a small hospital, and it certainly depends on how many beds, what the roll-out scheme is, if you're doing 20 beds at a time versus 50 beds at a time. Because obviously your super-users can be rotated to different units if you do it in a more staggered way. So it's hard for me to answer that question quantitatively, but qualitatively I'll say that is really a key component that will end up being a lot of what gets spent. Eric, do you have anything else to add to that?

Eric Poon: Not much; in working on the cost-benefit analysis for the bedside scanning piece, I'll definitely try to answer some of these questions. I think, but to address the issue of how much resources to invest in the training piece, I think that a lot of other hospitals, when they roll out technology such as this, probably not have adopted the very intense super-user model that we had; and I think that, but every time we talked to our front-line nurses, the reason they said this technology was successful, the reason why it was accepted, was because of the very intense training that we provided, 24/7 super-user support from nurses, and also from IT staff.

Charles Denham: Great. This is so helpful; and I think coming back to David before we go, to Ulrike, regarding some of the GS1 information. David, you know it was an honor to work with you on preparing and writing the CPOE Safe Practice; and we, along with you, David Classen, and input from our committee members as we wrote it, we spent a lot of time focusing on the care re-engineering piece, the staff training piece, doing a risk assessment of kind of what could go wrong and what should go right, and in order to prepare for a satisfactory and safe implementation of CPOE. As we now embark on writing a Safe Practice for bar code, do you think that we need to take the same approach because of this, the people-systems investment that we need to take to really make sure that we implement safely and adequately and get all the benefit?

David Bates: I think we do. I think we still don't know exactly what the right intensity is and whether you need to do something, that it is as resource-intensive as what we did, as Tejal described. I have the impression that it would be possible to do really well with something maybe less intensive, especially if you're using a system that's been implemented many other places. But I don't know that for sure, and I think as both Tejal and Eric just emphasized, the care in re-engineering and staff training parts of this are critical to make it work.

Charles Denham: Great, thank you so much. We're going to start on time and finish on time. We have nine minutes by my clock and we've done wonderfully. I really appreciate the speakers. I'm going to come back to Ulrike Kreysa and her colleague Jan Denecker just to ask two questions. And then we'll loop back to some more of the pearl-related questions, and some that are popping up on our Q & A and e-mails that are coming in to me. But from the standpoint of the GS1 standards, two questions: do some hospitals already have experience with GS1 standards? And then how could we as healthcare providers implement GS1 standards? I know, in our preparation for the Nice meeting, we talked about how critical it was for CEOs and leaders and board of members to make sure that there's an adequate investment in sending their people to these committees and also user groups so that we could keep things moving. It sounded like that was a barrier, but that's a leading question, so I'll just give you the first two questions and let you both kind of respond.

Jan Denecker: Thank you, Chuck. Let me start with your second question, which is how healthcare providers can actually start implementing GS1 standards. I think this is quite straightforward. GS1 is a global nonprofit standards organization based on membership by companies and healthcare providers and so on around the world. We are represented in over one hundred countries worldwide, and these member organizations basically bring communities together to solve supply chain problems such as, for example, when you look at medication safety – so to solve these problems by leveraging global standards. And these member organizations also support the members to implement the standards in their organization, be it for product identification, location identification, traceability, a number of processes. In the U.S. more specifically, we have a member organization – GS1 U.S. – where you can

very easily become a member, and then leverage the user community to facilitate the implementation standards in your organization.

With regards to your first question, in terms of hospitals – and hospitals have already had experience with GS1 standards – we indeed see, around the world, a number of leading hospitals that have been engaged in user groups and that have been paid in the past for the implementation of global standards to enable medication safety solutions in the U.S. Also, that several hospitals are engaged in GS1 help in the U.S. to advance the adoption of standards; and Ulrike has, for example, so referred to the sunrise dates for the adoption of GS1 standards in the U.S., which actually has not only been endorsed by the GPOs but also by the Application for Healthcare Resource and Materials Management arm of our association and a number of hospitals. So for us, what we have seen in the past is that there were a number of discussions in healthcare with regards to the value of standards, and also which standards to use, but today we see that this discussion has shifted to how to implement the standards and whether actually they are the first steps to take and what's the effort, the best timing. So that's how we see both these questions.

Charles Denham: Great, thank you very much. Ulrike, are there comments or any answers to any questions that you'd like to provide?

Ulrike Kreysa: I would just like really to ask everybody to get engaged. We are getting started on work for global standards for unit-dose marking. It's very, very important to have the user side engaged in this, because to get that right, you need to have all parties at the table and only if the users are putting their requirements to the table we can ask them in effect to do the right thing at the end.

Charles Denham: Thank you so much. You know, we have five minutes more for our Q & A session, and we at TMIT are building impact calculators for each of the NQF 34 Safe Practices, and then also for the two that we believe are very important and will likely be a part of our submission process for 2011, and those would be in the bar code and then separately for pain management. So we believe this is really important, and we also plan to collaborate with the GS1 team in terms of a global opportunity for harmonization, much like we've done with NQF Safe Practices nationally with the main stakeholders. So we really appreciate this input.

I'm going to come to a question from Kim Anderson regarding the Brigham. Is your policy regarding bar-code scanning specific as to when it is and [is] not appropriate to scan? Anyone want to take that one?

Eric Poon: I can take a stab at it. We do not require bar-code scanning in a code situation. So that's the one major exception –

Tejal Gandhi: Right, that was the one I was going to mention as well and there's a separate method to document code drugs that just allows you to bypass the scanning altogether.

Charles Denham: That in the emergency department all comers –

Tejal Gandhi: Well, we haven't implemented it in our emergency department yet, but I'm sure in the ED when we **do** do it, we'll have to have similar types of exceptions for codes and other things I'm sure.

Charles Denham: Great, how about the OR?

Tejal Gandhi: Not in the OR. So these are the areas that we really want to move into. I think there were a lot of questions about anesthesia and the OR and the PACU and the ED and our neonatal intensive care unit, and it definitely has not been implemented in those areas. And as I mentioned, the workflow in each of these areas can be so different, so it is a lengthy process to try to get it up in all of these various areas. Even just getting it into our oncology units, which Eric can talk more about, but getting it up on oncology, we had to do oncology several years after the main med-surg because there were so many issues related to oncology that had to be addressed.

Charles Denham: One question that came in over the transom is regarding the neonates, and we know that, in pediatrics, one of the heparin accidents we hear through the grapevine might have been related to turning off some of the safety systems because the wristbands were digging into the children's skin and that kind of thing. Any tips there, Tejal?

Tejal Gandhi: Well, what I can say is, it took a long time for us to come to consensus on the right wristband for the neonates for that very reason. To make it something that wasn't going to hurt their skin and also where the bar code could be big enough that it could be scanned, because they're so tiny. So, there was just a lot of work that went into picking the right band and the right bar code and all that for the neonates. We still haven't implemented bar-coding in the NICU yet, but we had to get the I.D. bands first; and then the NICU is slated to go up, I believe, in the upcoming year. Eric, is that correct?

Eric Poon: Yes.

Tejal Gandhi: Yeah. So all I can say is that there definitely were some specific issues to that population that a group had to work on for quite a bit of time.

Charles Denham: We are going to finish on time and we know that Dan Ford is on the phone with us and so what we'll do is stop the Q & A at this point, but please keep submitting your questions. We'll collect them on the site. And please let us know if you believe, which I do, that a practical implementation webinar at some future date for bar code, where we can convene multiple sites that are out in the field doing this, could share their best practices. It sounds like there's a rich opportunity to cross-share some of these.

And I want to thank each and every one of our speakers. This was practical, it was pertinent, it was really, really solid, and we really want to thank you all for taking time from your busy days. And we will record this, we will transcribe it. It will be available on our web site (http://www.safetyleaders.org/webinars/indexWebinar_June2010.jsp).

I'd like to turn things over to Dan Ford for 30 seconds to give us his inspirational pitch as a representative of the patients and families in the community, and then I'll close right after Dan. Dan?

Dan Ford: Thanks, Chuck, I appreciate it and I'm sorry I'm late. I see the role of the patient with bar-coding and computer order entry as to be in partnership with providers – this is key – to provide input and ideas regarding procedures for use and education of patients and health providers, to ask questions for clarification, and, when concerned, to be educated by providers regarding usage of these electronic aids, and to support and encourage providers regarding use of these remarkable developments. The patient is still the common thread to the entire patient experience and can have good observations and suggestions. And we encourage you and invite you to invite and to encourage active patient involvement. These aids are not the end all-be all, and still require human beings to play key roles. One hundred percent compliance will be required, where practical, in order to eliminate or seriously reduce errors. We cannot accept less than 100 percent and use short cuts and workarounds. And I hope you found these speakers inspiring and the information useful and are very encouraged about the possibilities. Appreciate you listening. Thank you.

Charles Denham: Well, thank you very much. I'd like to have the speakers just stay on the line so we could do a rapid debrief on anything we could improve on; and we thank our entire national audience. We know that there were a bunch of competing webinars today, and those [who] have missed it, it will be recorded, we'll have the transcripts; and please submit your suggestions and interests in this area. I think there'll be very strong interest. And we want to thank all of our presenters. And that ends our seminar today.