Hospital Inpatient Quality Reporting (IQR) Program

Support Contractor

SSM Health's Sepsis Core Measure Journey
Presentation Transcript

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Candace Jackson: I would like to thank everyone for being on today's presentation, titled *SSM Health's Sepsis Core Measure Journey*. I am Candace Jackson, the Inpatient Quality Reporting Program Project Lead at the CMS Inpatient VIQR Outreach and Education Support Contractor. I will be the moderator for today's event. Before we begin, I'd like to make our first few regular announcements. This program is being recorded. A transcript of the presentation, along with the answer to the questions asked today, will be posted to the inpatient website, *www.QualityReportingCenter.com*, at a later date. If you've registered for this event, a reminder email and a copy of today's slides was sent out to your email about a few hours ago. If you did not receive that email, you can then review the slides at our inpatient website and again, that is *www.QualityReportingCenter.com*. If you have a question as we move through the webinar, please type your question into the chat window and we will answer questions as time allows at the end of the webinar. For the presenters to best answer your questions, we request, at the beginning of your question, please type the slide number associated in the chat window. Next slide, please.

Our speakers for today's event will be Kimberly Izard, the System Sepsis Lead Facilitator; Alex Lacasse, the System Sepsis Physician Lead; Shelley Powell, the System Sepsis Program Leader; and Mario Schootman, the System Director for Clinical Analytics for SSM Health. In addition, we also have representation from the CMS measure support contractor with us today to assist with any technical sepsis measure questions. Next slide, please.

We would just like to note that the presenters for today's webinar are employees of SSM Health and have no conflicts of interest. Next slide, please.

I would now like to turn the presentation over to Shelley Powell. Shelley, the floor is yours.

Shelley Powell: Thank you. Good afternoon, everyone. Thank you for joining us. The purpose of our presentation is we're going to share our processes and tools that we've used to implement the sepsis core measure and then continuously improve our results. I want to stress the point about

continuously improving because, as you hear us talk about our story and our journey, you will see that we have continued to resolve and implement various cycles of improvement to bring us where we are today on our sepsis journey. CMS' sepsis measure support contractor will be on the webinar to answer technical measure questions. They will not be answering questions about SSM Health's experience, and any question and answer follow-up from this webinar will only address the technical measure questions where CMS is providing a response. Next slide, please.

Learning objectives for our webinar today: At the conclusion of our program, we would hope that you will have an understanding of a comprehensive sepsis improvement plan using what we call a multimodal team approach and, in a future slide, you'll hear about what we mean when we talk about a multimodal team approach. We'll also be sharing how to create and use daily and monthly reports to monitor compliance with those indicators associated with sepsis care. Then, our most recent work on this journey to improvement is how we're using advanced analytics or machine learning to identify those opportunities for continuously improving our program. Next slide, please.

There is a table of acronyms and abbreviations provided for you, so please use this as a reference as we go through our presentation and let us know if you do have questions as you see acronyms and abbreviations in our presentation. Next slide, please. Then, go ahead to the next slide.

We'll give you a little bit of information about who SSM Health is. Next slide, please.

We're a multifacility system located in four states, and our system office is located in St. Louis, Missouri. We have ministries; we refer to our facilities as ministries, within Missouri, Illinois, Wisconsin, and Oklahoma. We're a not-for-profit healthcare system. We have nearly 40,000 employees spread across our four states and over 11,000 physicians or providers. We have 23 hospitals; we have post-acute facilities; we have ambulatory care settings. We're a multifacility healthcare system. I want to call attention to the graphic on the right.

We have geographic regions that support our system approach, and you'll hear us talk about our regions farther into the presentation. So, at the system level, we have our overall program for improving sepsis, but it's supported by our ministries in our mid-Missouri region, in our Wisconsin region, our Illinois region, Oklahoma, and St. Louis. Next slide, please.

This graphic illustrates our overall program development and the phases or the cycles of improvement that we have implemented. In 2009, that's when our initial work started. We started with one hospital, a local initiative, and developed collaborative work between our emergency department and our intensive care unit clinicians at that particular hospital, incorporating evidence-based guidelines into our clinical workflows within our electronic health record. Our next cycle of improvement was we escalated that local work to then some regional initiatives starting in 2011. So, a multidisciplinary team was established and started to look at what types of standardized practices and processes needed to be in place and what types of education needed to be in place in order to support the work, and then we started data monitoring. The next cycle of improvement started in 2013 where we improved that system approach and took what was a regional initiative. So, if you think back to that graphic that I referred to on our map, where we had our regions outlined. We took what was a regional approach and then evolved it to a system approach, implemented the SEP-1 core measure bundle across our entire system, developed system-wide sepsis team education that continues to be updated. You'll hear us talk a little bit more about that farther into our presentation. We continued our electronic health record support with clinical workflows and monitoring SEP-1 compliance and then continued our data monitoring.

The next cycle of improvement brings us to where we are now with a formal system-wide improvement campaign; and that's our terminology that we use when we talk about our program that's made up of multiple projects and teams that support our sepsis work across the system. So, we implemented standard work, and that just means that we conducted a gap analysis at our various ministries across the system to find out what was

working well, what needed to be improved, and what kinds of processes needed to be standardized across the system so that we had best practices in place; we implemented Code Sepsis; we referred to the TIME acronym in making sure that temperature, infection, mental decline, and extremely ill was incorporated into our processes; and then established a medical emergency for our sepsis work. We continue with our data reporting, and you'll hear us talk about this again farther into the presentation where we set up daily reporting with leading metrics or in-process metrics. Our ultimate outcome metrics is sepsis mortality; then we have in-process metrics that we look at on a daily basis to see how we are doing with implementing the bundle and the standard work that we have in place so that we know if we're going to achieve the outcome that we've set. We also established monthly reports. You'll hear us talk about that farther into the presentation and include some examples. Then, our most recent cycle of improvement is taking that reporting and the data analysis and making it more sophisticated and implementing some advanced data analytics and then a predictive tool, which you'll hear us talk about. Next slide, please.

I'm going to turn it over to Dr. Lacasse who will talk about our sepsis overview and how that feeds into our program development. Doctor Lacasse?

Alexandre Lacasse: Thank you, Shelley. I'm Alex Lacasse. The journey of sepsis actually began way before our journey at SSM in the early '90s. Next slide.

So, our journey in sepsis started way outside St. Mary's and SSM in the early '90s. Early on, really the primary focus of the actual medical community was to define sepsis based on what actual pathophysiology of infections were at that time or research was at that time. Sepsis became a systemic disease with immunology roots, and it started to involve different bodily systems that were all interconnected together and explained how we saw diversity in our clinical presentation. So, the task of defining sepsis took a decade, and it's still ongoing, quite frankly. It has been recognized, but not universally accepted, and there's been some iterations along the way; but, at least, we have a good scaffolding on what we can build for the future. In the early 2000s, this is where the early goal-

directed therapy concept with the one center study by Rivers and colleagues served as a very important landmark of what we're trying to accomplish today. The notion of earlier the better and multifaceted intervention were laid out. This is where, at the same time, the Surviving Sepsis Campaign became a household name for everyone in patient safety and quality with guidelines that are updated every four years, with interim updates from time to time based on clinical data, and also where an attempt to define time zero was done. Next slide, please.

This is intended to really have a brief overview of the history of sepsis treatment along the way. We started our sepsis journey way back when, about a decade ago, and, since then, multiple revisions of guidelines have taken place in an attempt to refine what we're doing to better ourselves and have better outcome for our patients. Really, if you look back in the last five years or so, this is where, since 2014, the concept of bundles really took place with different trials that are listed on the slide and different studies where the Surviving Sepsis Campaign really focused on the three- and six-hour bundle to optimize mortality in sepsis with the goal to decrease by about 25 percent in the next five years or so. Since then, there's been several studies, although controversial, would point that the data is actually in favor of earlier administration in antimicrobial treatment to decrease mortality and delay in treatment favoring a worse outcome. Really, overall, there's been other definitions of sepsis thrown at us over the years, especially in 2016, when we have decided to remain with our Sepsis-2 definition and our SEP-1 bundle so that we can actually be aligned and partner with CMS in our journey. Really, the concept of bundles since 2018 has come from a three-hour to a one-hour to make it very stringent and really putting a stamp on accountability so to make sure that our patients actually have a better outcome. So, we tracked our one-hour bundle, and that's going to be one of the focus of the discussion as well with a data presentation that will be forthcoming. Next slide, please.

So, if you actually look at the concept of bundles, there are three arms: a diagnostic one, a therapeutic one, and a monitoring one; and, this is basically known as the SEP-1 bundle, and, if you think about it, it's all-

inclusive, so we have to have all of them met to have a passing grade. So, this brings much accountability in our process, and we feel that our journey is only the beginning; and, really, when we look at SEP-1 compliance in our different PHQ efforts at the system level, we're trying to better ourselves with the community and also for the benefit of our patients. Next slide, please.

Shelley Powell: At this point, we're going to turn it over to Kim Izard.

Kimberly Izard: Thank you, Shelley. So, as you can see on the left-hand side, you see a visual representation of what Shelley mentioned in the prior slide that we chose a multimodal process to create a comprehensive sepsis improvement program. So, with that, we created a mortality improvement campaign. The first step was to develop a system approach by forming a System Sepsis Mortality Improvement Campaign. This team included clinical leaders, hospital champions, which fostered cooperation across the system. This team completed a gap analysis and developed standard work, as Shelley mentioned prior, and reviewed the data. One of the first steps we took from there was to create and organize a core measure team for sepsis across our health system. Part of this team's goals was to develop standardized work goals across our system and work with our Epic specialist to optimize the flow within our EHR. This team standardized our outlier or variance reports so that the data was reported the same across our systems. Included in that process was the development of abstraction guidelines, sharing of our IQR CMS responses, and templates for our front-line staff. We standardized smart phrases and dot phrases to assist the staff with the required documentation. A SharePoint site was developed within our intranet so that we could all have access to our tip sheets, our handoff sheets, IQR responses, our data, etc. This team collaborated with the regional and hospital teams to develop a Code Sepsis process and a handoff tool for nursing. Initially, this was a paper tool that recently has been added to our HSR as part of the sepsis narrator as a checklist and handoff tool for our front-line staff. The next step in our process was our education. We standardized education plans that could be utilized across all regions. Tip sheets were created and shared with

regional and ministry communities so that our communication was consistent across all of our hospitals. The tip sheets are updated with each release of new specifications. We worked with our education department to create an online learning module that was mandatory for all of our staff. The system office worked with small teams with representations from all regions with our PR group to create a sepsis video to help spread awareness to our staff and to the public. This video is currently available on YouTube, and I encourage you to access that and use for staff education, if you so desire. As most are probably aware, September is Sepsis Awareness Month. We created multiple activities, including screensavers, badge cards, etc. This year, our hospitals took it to a new level creating escape room games, Jeopardy games with prizes, sepsis walks, etc. Our next step was to create a sepsis coding and documentation team. As we progressed on this journey, an opportunity... I'm sorry. Next slide, please.

As we progressed on this journey, an opportunity was identified by our coding and CDI departments. A separate team was developed to review and address our opportunities for coding across our system. This team works to standardize our coding processes and provides education to our physicians and mid-level providers on our required documentation. This team tracks each case coded with sepsis, severe sepsis, and septic shock and reviews this data monthly and tracks for improvement and opportunities. The team uses a tracking sheet which is reviewed and shared at the monthly meeting. One of the challenges we are facing is the difference in definition and criteria for sepsis, severe sepsis, and septic shock. Some payers do not follow the SEP-1 guidelines, and other coding criteria differ from the CMS SEP-1 criteria. As we continued to grow and mature with our processes, we recognized a need for more in-depth analysis of our data in order to improve the care we were providing to our patients. This team reviews and analyzes the data using various methodologies. They use a variety of reports to drive process improvement. Dr. Schootman will go into greater detail later in this presentation. As you can see here on this slide, our next step was to use the sepsis predictive provided by Epic, our EHR, to help assist us in

identifying a patient with classical sepsis. This was done in a phased go-live approach. We started with one ministry and reviewed issues and opportunities of the tool. We made adjustments, analyzed the data again; and, when we felt that we were ready, we expanded the tool to other hospitals one region at a time and listened to feedback from our end users of the tool. Dr. Schootman will go into the detail of our analysis and how we use the data provided by the tool. Next slide, please.

At this point, I will turn the presentation over to Dr. Mario Schootman.

Mario Schootman: Thank you, Kim. The purpose of our sepsis-related analytics and methodology are three-fold: first, to monitor quality metrics; second, to identify opportunities for quality improvement; and third, to evaluate the implementation of program improvements. On the next slide, you'll see our key performance indicators on the next slide, please.

Thank you. This figure shows our key performance indicator over time. In this case, it is sepsis mortality. We use three types of goals: green, yellow, and red; so, we're not just satisfied with achieving goals. We also use stretch goals. In this case, they're the green part, the exceptional for 0.95. The dots are the monthly values and the dashed line is the three-month moving average to provide more stability for smaller hospitals that are also within our system. This slide shows that we're starting to make progress since the fall of 2018. More recent data than April of 2019 showed that we are at 1.06 for year to date for sepsis mortality. Next slide, please.

One key aspect of monitoring quality is to examine the variation across our hospitals; and, we aim to reduce, just like everybody else, to reduce that variability across our hospitals. One tool that we are using is the funnel plot. This slide helps identify which hospitals are doing better or worse than expected. The horizontal line is the expected ratio, and hospitals that are above two standard deviations are doing worse than expected based on the number of patients, which is shown on the X axis. Hospitals that are below two standard deviations are doing better than expected based on the number of patients, again on that X axis. We

monitor this on a monthly basis and provide this back to our individual hospitals. Next slide, please.

Here are the results for sepsis mortality in 2019; and, like I said, we provide this on a monthly basis. So, we do have more recent data showing, in this case, some hospitals are doing better than expected in the teal dots which are below the gray line, the lower gray line. Others are doing worse than expected and are above the top gray line. Using more recent data shows increase in separation between hospitals that are doing better and those that are doing worse than expected. Next slide, please.

In addition to using funnel plots, we also monitor quality on a monthly basis using control charts. This is a standard control chart that I imagine that you've seen before. We've displayed the goal in the green diamond, in this case pointing to the average performance with a dotted line and the monthly values that are in the dark blue line. Control charts are helpful to determine if a process or a metric is in control. Next slide, please.

This figure shows an example of monthly reporting of SEP-1 bundle compliance, which is in this case done in Excel. This graph automatically analyzes if the process is in control and progressing towards the goal or not. You can see in the past two years, SEP-1 compliance has increased from less than 40 percent on the left-hand side of the slide to about 60 percent, and this is based on core measure data. The red lines denote the three standard deviations above and below the mean in this case. Next slide, please.

Here is a control chart for initial lactate use. SSM is at 95 percent and above the goal, the gray diamond in this case, during the past 12 months. Also, the month-to-month variation during the past year was reduced compared to the previous year based on the width of that three-standard deviation. Again, those red lines are displayed on this figure here. Next slide, please.

This figure shows a similar control chart for repeat lactate use. Again, we are close in meeting the goal of this current year. The goal is at 88 percent. Next slide, please.

In addition to the monthly reporting we do, we also report daily in order to get close to real time and be able to identify opportunities closer to where the care is being delivered and when the care is being delivered. We try to identify those opportunities more rapidly. We started reporting daily use of ordersets used in emergency department. Then, each CMO, Chief Medical Officer, followed up in order to hold people accountable locally. The row in blue, the description, shows the column headings for the Excel file that is provided to the local emergency departments. Next slide, please.

This is an example of the information that we provide back to the local ministries, the local hospitals. Antibiotic use is clearly a key component of sepsis care, as Dr. Lacasse talked about, and we provide an Excel file to over 200 local stakeholders and local users to monitor the number of patients who receive antibiotic use within one hour of ordering on a daily basis. We also provide which patients did not get antibiotic use within one hour. Clearly, we're able to do this for each of our hospitals. Next slide, please.

Here is an example of how we monitor the percentage of orderset use and antibiotic use within one hour of ordering on a daily basis using control charts. Antibiotic use within one hour means the time between ordering and antibiotic administration, so not time zero. Obviously, time zero is difficult to determine without abstracting medical records. As you can see, we show significant improvement over time. Antibiotic use is even beyond three sigmas in recent months, which is clearly a very good thing. As you can see, the width of those three standard deviations above and below the mean is also becoming tighter and tighter. This means that the system is becoming more and more in control. Next slide, please.

So far, I've talked about monitoring qualities and key performance indicators, funnel charts, and also control charts on a monthly basis, but

also on a daily basis. I'll now talk about a few use cases that use more advanced analytics related to sepsis. Next slide, please.

This is our first use case: how to determine the extent of the variability in sepsis mortality across hospitals and how much the SEP-1 bundle compliance contributes to this. This will then determine how much opportunity there is for us to implement additional program improvements, and we're using core measure data of severe sepsis and septic shock, and then also a multi-level logistic model that I'll describe in a little bit more detail in subsequent slides. Next slide, please.

It's really important to think through the conceptual model and how variables explain the variability in sepsis mortality at the hospital level. Ultimately, we want to unpack this blue box displayed here to explain what drives the variability across the different hospitals in SSM so we can then identify what needs to be done to further drive down sepsis mortality. Next slide, please.

But first, before we get into the statistics and the analytics, I will have to tell you a little bit about the data structure. So, I mentioned previously that we're using a multi-level model. That simply means that patients at level one, here at the bottom in the circular display, are nested within hospitals at level two; so, patients who are treated at the same hospital are more similar to patients who are treated at different hospitals, as you can see on the next slide.

Here, this displays the level one and level two that I just mentioned to you as part of this multi-level model that we are currently using. Next slide, please.

First, you may wonder how much variability there actually is in sepsis mortality and SEP-1 bundle compliance; and here on the X axis, you see the hospitals that I anonymized are sorted by SEP-1 compliance. All the way on the left is the hospital with the highest level of compliance, and, on the right, the hospital with the lowest level of compliance; and, it appears that with decreasing SEP-1 compliance, there's an increase in sepsis

mortality. You can see this on the right-hand side of the slide. However, I do have to mention that one of the key limitations here is that there is no indication of the number of patients in this slide. Also, this graph does not take into account differences in patient characteristics across the different hospitals; so, this is just an eyeball to see how SEP-1 bundle compliance increases and then shows a decrease in mortality from severe sepsis and sepsis shock. But, what about the statistical approach? From a statistical viewpoint, we have to go into much more detail to really answer this question, and that's really where multi-level models are helpful and important to use. Next slide, please.

So, we developed and used two different multi-level models. Model A has a lot of variables from the core measure data of patients with severe sepsis and septic shock, including these variables in the model source that reduce the variability in sepsis mortality across the different hospitals. As a result, we have leveled the playing field in terms of these variables. These variables include sex, race, age, comorbidity, primary payer, and so forth. The extent of the variability in sepsis mortality in model A is based on the interclass correlation coefficient, also abbreviated by ICC. This ICC ranges from zero to one, 0 percent to 100 percent. An ICC of .128 or 12.8 percent suggests that 12.8 percent of variability, the variation in sepsis mortality, among severe sepsis patients and septic shock patients is located across the hospitals. Model B uses these same variables, but also adds SEP-1 bundle compliance at the hospital level. As a result, the ICC is reduced to .117 or 11.7 percent. As a result, differences in SEP-1 compliance across hospitals account for less than 10 percent of the variability in sepsis mortality across the SSM hospitals. So, as a result, there is lots of improvement, lots of room for improvement for implementation of additional program improvements to reduce sepsis mortality at the hospital level. Next slide, please.

This is our second use case as an example of some of the work that we're currently doing as part of our analytic methodology. The previous slides showed views of SEP-1 bundle compliance across hospitals, and it did really show a huge variability. The question then becomes what would the

effect be on sepsis mortality if you could increase SEP-1 compliance beyond current levels. How would that then affect sepsis mortality?

On the next slide, it shows that we need different pieces of information to really answer that question. First, we need the current level of SEP-1 compliance. So, let's say that it's 55 percent at a particular hospital at SSMHealth. Second, we need the hospital's current sepsis mortality performance, for example 1.0, an O/E ratio of 1.0. Third, we need information about the effectiveness of SEP-1 bundle compliance under risk of death from sepsis in SSM Health patients. If we know all these three pieces of information, we can then do a what-if analysis to determine how increasing SEP-1 compliance would affect hospital mortality among patients with severe sepsis and septic shock. So, this will obviously also be helpful in setting achievable KPI goals for hospitals based on their SEP-1 compliance. I already briefly talked about SEP-1 compliance and sepsis mortality, but not yet the third piece.

On the next slide, it shows an analysis that we did last fall using core measure data and a logistic regression model and showing that the risk of death for a patient with severe sepsis or septic shock was reduced by 48 percent, or nearly half, when they received the SEP-1 bundle versus when they did not. Also, we showed that the percentage of patients who died was 7.1 percent when they did receive the SEP-1 bundle, compared to 12.9 percent when they did not receive the SEP-1 bundle. We then estimated that when an average of 18 patients received SEP-1 bundle compliance, one sepsis death would be prevented. This is calculated as the inverse of the difference between 12.9 percent and 7.1 percent; so, that is 5.8 percent, which is actually .058. So, 1 divided by .058 shows 18 patients needed to receive the SEP-1 bundle in order to prevent one sepsis death. So, now we also have that third piece of the information. Next slide, please.

Here, we display some of the what-if scenarios using three of these pieces of information. So, if we increase SEP-1 bundle compliance from 55.1 percent, as I showed on the previous slide, to let's say 65.1 percent during the remainder of the year, for example May through December, we then

also have an estimated 410 severe sepsis or septic shock patients based on prior data, then two additional patients would be prevented from dying based on all these three pieces of information. The O/E ratio would then be 0.96 from a value of 1.0, and this will help determine the extent of local allocation of additional resources to improve the SEP-1 bundle compliance. You can also see then scenario 2 and 3 here as well. With an increase in SEP-1 bundle compliance, an additional number of patients will be prevented from dying during May through December, and that then would subsequently more effect the O/E ratio for sepsis mortality.
Next slide, please.

Here is the final use case, the third use case, which is a preliminary evaluation of the implementation of the sepsis predictive tool within Epic in the SSM Health system across our different hospitals. Based on the literature, it's not entirely clear that such a tool does affect patient outcomes. There is really some confusion in the literature in terms of if it actually does or if it is beneficial or not. Our implementation started with one pilot site in late 2017. Epic calculates the probability of developing sepsis based on various patient characteristics and displays the result within Epic. Above 6 percent in an emergency department and an alert is fired; and, above 8 percent on the inpatient side, a different alert is fired.

On the next slide, we show the example of what this actually looks like in Epic. On the left-hand side, you can see the red clock icon which displays if a patient has been started on a sepsis treatment protocol. Now, the Early Detection of Sepsis Predictive Model then generates this score, and a rising score indicates a strong possibility that the patient is developing sepsis. Alerts are then generated and triggered if that score reaches 6 percent in an emergency department or 8 percent on the inpatient side. This model within Epic includes various demographic, clinical, and laboratory values. Next slide, please.

This figure shows the progression of the implementation for our Sepsis Predictive Tool within Epic for different hospitals. The staggered implementation approach allows for a unique opportunity for the evaluation of the predictive tool as well. Next slide, please.

This figure shows how we approach the evaluation and the analytics of the predictive tool using core measure data. I totally realize that there are lots of additional aspects of the tool, of the Sepsis Predictive Tool, that we are not describing here today. So, this is only part of the evaluation and it is a preliminary evaluation as well. So, we focus on the outcomes of antibiotic use within one hour, SEP-1 bundle compliance, and also sepsis mortality. Because of this staggered implementation, we broke the hospitals up into two different groups. The first groups are seven intervention hospitals and the second groups contain six control hospitals. Then, we also have two time periods: before the implementation and after the implementation of the Sepsis Predictive Tool, both in the intervention hospitals as well as in the control hospitals. Next slide, please.

The analytical approach that we are using is called a difference-in-difference approach, and it focuses on what the differences are between the key potential changes over time. So, here you can see the pre-implementation time period and the post-implementation time period for each of those two different groups; and, it then focuses on what the differences are between the two potential changes over time between those two groups. One additional advantage of using this type of approach is that we can also take into account differences in patient characteristics between both groups because this is not a randomized clinical trial. Next slide, please.

Here's an example of what this looks like for SEP-1 bundle compliance using core measure data. For example, at the pre-implementation, SEP-1 bundle compliance was 43.3 percent in the intervention group and 46.4 percent in the control group. Both groups then increased to 55.4 percent for the intervention group and 54.7 percent for the control group at the post-implementation period. So, the intervention group increased 12.1 percent in SEP-1 compliance and the control group increased by 8.3 percent from pre- to post-implementation period; and, this shows that the increase was 3.8 percent greater in SEP-1 in the intervention group versus control group, and this takes into account various patient characteristics that I disclosed here on the bottom right-hand side. However, this was not

statistically significantly different from the value of 1, because the value of 1 was included in the 95 percent confidence interval. Next slide, please.

For antibiotic use within one hour, the increase was 6.7 percent greater in the intervention group than in the control group at the top left-hand side, and you can see how both groups, the intervention group and the control group, increased over time. Again, the increase was 6.7 percent greater in the intervention group than in the control group. This was close to being statistically significant. Next slide, please.

The third outcome that we used was sepsis mortality, and, you can see, by controlling for these same characteristics, the decline was 1.8 percent greater in the intervention group than in the control group; so, this is encouraging, but this is not statistically significant. However, there were, fortunately, relatively few deaths, 65 during the post-implementation period. So, we have to wait until we have a little bit more data to be able to more firmly determine if the Sepsis Predictive Tool did make a difference. Next slide, please.

As with any such study, there are many limitations to the evaluation of the Sepsis Predictive Tool that I just described to you. Most importantly, as I mentioned already, these are preliminary results, and we've only focused on three outcomes: antibiotic use, SEP-1 compliance, as well as mortality. But, clearly, the IGs are the most important ones as well. So, we will have to wait to obtain additional data in November from Press Ganey about the core measure data when that data is available to be able to more firmly and more conclusively analyze the Sepsis Predictive Tool at SSM and its effective on patient outcomes. Next slide, please.

Shelley Powell: This is Shelley Powell again. So, in conclusion, wrapping up our formal part of the presentation, some closing points is that we're learning that implementing the sepsis core measure and an improvement initiative requires a lot of education that needs to constantly be updated, a multidisciplinary team approach. You've heard us talk about all of the different pieces of the puzzle that come together to help us establish our sepsis program approach. Standardizing processes is also key to making

improvements. I mentioned that earlier in the presentation, and Kim referenced it, too, as she described our program. We saw opportunity to look at best practices and make sure that we have best practices implemented within our ministries or our hospitals across the system. Then, the point that I made at the beginning of the presentation, there's always room for continuous improvement. We continue to learn from our data, as Dr. Schootman illustrated with his part of the presentation. We're constantly asking questions and gathering data to help answer those questions. Our sepsis data reporting and our reporting tool should be used to drive our improvement, so we're basing our decisions on data. Then, our advanced data analytics helps that progressive decision-making and improvement efforts. So, as Dr. Schootman illustrated in his part of the report, we're starting to ask more advanced questions about how we can be improving the care of our sepsis patients, how the predictive tool is helping us, and how it's making a difference. Next slide, please.

I want to call out attention to many team members that make the work possible within SSM. Dr. Alexander Garza is our Chief Medical Officer, and he serves as our executive champion for the work across the entire SSM Health System. He helps remove barriers when we do have barriers. He helps drive the strategy and overall direction for the work. Dr. Avi Gandhi, who is also here in the room with us, is helpful in his role in providing data analytics support and reporting. Kim Izard you heard from today. Dr. Lacasse is instrumental as a subject-matter expert and physician champion for our work. Leah Meyer, who is in the room with us also, she initiated the work that we have in place with our sepsis program in those early stages and continues to provide support. Myself. Paul Reading, who is also in the room with us, he's a key member of our team, helping us look at our outcome data and our reporting processes and optimizing those the best we can. Dr. Schootman, you've heard from. Then, Margie Troyer helps provide support from our electronic-health-record part of the puzzle. She helps develop the workflows within Epic and has also been instrumental in the development of the predictive tool that Dr. Schootman spoke to. Next slide, please.

That brings us to the end of our formal presentation and we have time for questions.

Candace Jackson: Thank you, Shelley. At this time, we will address some of the questions that have been submitted through the chat window. Please note that the questions are in no order and that we will not have time to address all the questions submitted. As noted earlier in the presentation, the questions and answers from today's webinar will be posted at a later date; however, the posted Q&A document will only contain any technical sepsis measure questions that were submitted, where CMS is providing a response.

So, let's begin with our first question. Our first question is directed to SSM Health, and I believe the majority of our questions today will be addressed to them. The question is, "What is the process of your Code Sepsis and who responds to the Code Sepsis?"

Alexandre Lacasse: I can take that question. Alex Lacasse. We do have, from the moment that a patient comes to emergency room, we do have best practice alerts, or BPAs, that will be fired – I shouldn't say fired – but that will come on when different search criteria are met with presence of an infection. So, we go back to the definition of Sepsis-2 and not Sepsis-3. That's usually done, depending on the different ministries, by a triage nurse or a triage physician if we have the possibility of doing that. That alone will speed the process of having blood drawn so that we can actually feed the sepsis tool. The sepsis tool actually looks at 80 different parameters, and they're all weighted and take into account obviously the search criteria but other things that are populating the chart, and it looks at that every 15 minutes in the background. Now, based on that data, then a physician is alerted through a team leader in the department since 80 percent or 90 percent of our severe sepsis or septic shock patients' journey, unfortunately, starts in the emergency department. So, we have that process going with very tight multidisciplinary nursing leaders, with physicians. In our emergency departments, we do have sepsis champions that provide constant feedback based on the data that we gather from our quality personnel. When that is instituted, there is a possibility at any time of calling a Code Sepsis, and this is where the clock starts. This is where all hands are on deck with

assigned personnel that will help the process and coordinate with the physician. We do have a process that is based on the one hour; so, this is something that, for us, compared to the three-hour bundle, we felt that one hour was the goal that we wanted to achieve based on Surviving Sepsis Campaign updates and the New York State experiment concluding every hour delay would increase sepsis mortality between 4 percent to 7 percent. So, our goal at SSM, our internal goal, was one hour compared to CMS' goal of three hours for the first element of the bundle. So, we do have that in place. The physicians have an Epic orderset that we use that we track, as Dr. Schootman mentioned and showed data, so we can actually go back to the data piece and feedback mechanism so that we get better on somewhat of a daily basis. We have decided to do that because it does give you data that is very accurate and also that is actionable. We don't wait the typical months and months of abstraction because we want our processes to get better quickly; so, therefore, we need feedback to the team and the physician, and we are actually trying to improve that process overall at the system level, as well, as we speak right now.

Candace Jackson: Thank you. Our next question, we had several ask this. They are wanting to know what is the name of the sepsis video on YouTube?

Shelley Powell: It's called the SSM Health CMS Sepsis Core Measure Education.

Candace Jackson: Wonderful, thank you. We have a couple of questions related to slide 18, if we could go to that slide. The first question is, "What was the size of the hospital where this was first piloted?"

Alexandre Lacasse: Can you repeat the question? I just missed the first part.

Candace Jackson: The question is, "What was the size of the hospital where this was first piloted?"

Alexandre Lacasse: Alex Lacasse, I'll take the question. Actually, I'm the sepsis chair of that hospital. I am also the... There's a residency program in internal medicine at that hospital linked to our academic profile at SSM. It's a 350-bed hospital with a three-residency program: OB/GYN, family medicine, and internal medicine. It is also a hospital where a hospitalist contractor group

is providing most of the care on an inpatient basis. We have a 24-bed ICU, and we also have dedicated PCUs. There's two of them, or step down as they used to be called. We actually, to pilot this, we used one of our PCU units. The reason we did that is, at the time we piloted that, we did a rapid improvement event where several of the leaders of that unit were on it, including myself, and we knew about the Epic predictive tool, and we knew, based on what the data was showing, that it was alpha tested and was working in the background. What we did not know was how to implement and make it operationalized where we make sure that the data that's there every 15 minutes can actually be actionable in due time and due process. So, we were tasked to do that, and that's when the Code Sepsis started from then because we had good success with implementation of the one-hour SEP-1 with a multidisciplinary approach, again with participation of either hospitalists, residents, pharmacists, nursing, house supervisors, phlebotomy, basically, taking a village to actually implement this. We had very good success and we had almost 90 percent compliance with different elements of the bundle; and, that was the start of why we decided to go ahead and continue our Code Sepsis implementation at different ministries.

Candace Jackson: Thank you, and our next question is also on slide 18, and this is a multi-factor question: "Please describe how improving education for providers and patients has improved your sepsis process. Which components have been most effective, and how is patient education contributing to your process improvements in general and to your SEP-1 compliance?"

Kimberly Izard: So, this is Kim Izard. With our education across the system with sepsis, we developed our team, as I mentioned earlier, and we created these tip sheets, and they were very specific guiding the clinical teams through the process of what they needed to do in order to meet each criteria of the bundle component. So, this has helped our different sepsis committees across the system in all of our regions with all of our ministries to provide this to their clinical folks. Our sepsis committees are very engaged. They're physician-led, as well as nursing. They have patient safety quality representatives there. We update this tip sheet on a regular basis according

to any changes by CMS specifications, and I think that improving SEP-1 compliance, this is a difficult measure to track and to perform. Each patient and case, of course, is unique. Each presentation is unique. I think, though, with the heightened awareness from all of our clinical folks in the ED and at the bedside, and as Shelley mentioned earlier, just continual education and providing that continual improvement process across the system. I hope that answers your question.

Candace Jackson: Thank you. We'll go to slide 28. Our first question is, "Do you have other ordersets for infectious processes? For example, do you also have UTI or pneumonia ordersets? If yes, at what point do the ED providers engage the sepsis orders? Do they have to meet criteria and then switch to the sepsis orders?"

Alexandre Lacasse: So, I'll answer the first part of the question. We actually have separate ordersets for different disease processes that are infections, so pneumonia, UTI, CMS infection, intraabdominal infection. These ordersets are actually also created and updated at the system level, so going back to the region and ministry again. So, we do have that. I think I can answer the second part. Physicians can switch ordersets. That's been somewhat problematic from time to time when it comes to our sepsis endeavors. To streamline the process is part, I think, of the journey that we're having here to link the Code Sepsis to an orderset, and that's actually in the making right now.

Candace Jackson: Thank you and one additional question for slide 28: "What criteria did you use for your daily report to determine which patients to include on a report? Choosing only patients with an admitting diagnosis with sepsis would not bring attention to patients whose sepsis was not caught in the ED."

Avi Gandhi: Good afternoon, this is Avi Gandhi, a senior analyst. The first criteria that we used was, "Was the patient admitted into the emergency room." After that, we do look at the ICD-10 codes. I believe there are 25 to 40 various codes that have the word sepsis in it. So, then we try to identify whether those patients did have either any one of those sepsis codes in their patient

chart. Then, after that, we then look to see if an orderset was ordered and, then, whether an antibiotic was provided within one hour, and, as Dr. Lacasse mentioned, the one hour is just our internal goal.

Candace Jackson: Thank you. For our next question, we'll go to slide 35. The question is, "Do you perform 100 percent review of SEP-1-eligible patients or a sample, and what is the timeframe?"

Kimberly Izard: This is Kim Izard here. We do sample our SEP-1 population as prescribed by the CMS specifications, and the time frame of this particular slide... Mario?

Mario Schootman: This is 2018 and on.

Kimberly Izard: So, the timeframe of the particular slide that you're looking at is from 2018 and forward.

Candace Jackson: Thank you and our next question: "Would you mind, please, speaking to how SSM addresses the 30 ml/kg IV fluid bundle element for patients identified as being at risk for fluid overload, for example, congestive heart failure, dialysis, etc. Do you treat these patients differently? If they do receive the full 30 ml/kg of IV fluids, what are the outcomes for these patients?"

Alexandre Lacasse: Alex Lacasse. I'll take that question. So, we don't force people to give 30 ml/kg if it's not indicated. So, we first go by what the patient presents with and what is important for the actual patient. To answer another question, we do use in the orderset 30 ml/kg as part of our workflow. We do analyze our outliers when they actually fall out of that. If we feel that education will help to use a better approach, we will do so; but, as we all know, clinically, some of those patients, that's been debated in the literature about the proper amount of fluids time and time again. So, we're still using the 30 ml/kg, but when physicians are not using it with appropriate clinical grounds, it is what it is.

Candace Jackson: Thank you, and our next question is, "Do your facilities have dedicated sepsis coordinators?"

Kimberly Izard: This is Kim Izard here, and, no, we do not. This work is done as a community across our hospitals and our regions. None of our facilities have dedicated sepsis coordinators, except two. Two do.

Candace Jackson: On kind of that same note, then, how many are on a sepsis team at each hospital?

Kimberly Izard: That varies, as well. This is Kim again. It just depends on the size of the hospital as to how large the committees are and who sits at each committee. Usually, there's a physician champion there. There's usually the CMO there of the hospital, patient safety quality representation, clinical leaders of the ED, and the inpatient units as well. Did I cover all that?

Alexandre Lacasse: Yes, pretty much. I mean, since I'm the sepsis chair at one of the hospitals, it's multidisciplinary, both ED and inpatient, obviously led by our quality department and physician-led with very, very strong nursing team leadership, and we also have pharmacy present. We also have coding present. We expanded also to have, since at my ministry there's different residency programs, we have a representative of every residency, even our OB/GYN, which is something very interesting in the sepsis literature and the predictive tool. So, it's very multidisciplinary. We go over data, but we also go over the different processes where we think we could improve. That's on a monthly basis.

Candace Jackson: We'll kind of stay on this same topic. So, we just heard you do not have sepsis coordinators; so, do you have someone in your facilities tracking patients real time and providing feedback and intervening with nursing and providers?

Leah Meyer: So, this is Leah Meyer. We do have, just to clarify, we do have sepsis coordinators at two of our ministries. We do also have patient safety quality coordinators at the rest of our ministries, and they kind of act to assist with that real-time review; but, as we mentioned with the data that gets sent out daily, it gets sent out to a whole slew of people. So, we all kind of work together to catch the real-time interventions, and the leaders

in the EDs across our system, they'll follow up when they get that data if we're missing any interventions. So, we haven't seen a whole lot of differences in the care from the two hospitals that have the coordinators because we have so many others that are following up real time at the other ministries.

Alexandre Lacasse: We do receive that report on a daily basis sent out to a significant number of team leaders, including our ED leadership. We know that our ED leadership is crucial in that equation, and, there's not, quite frankly, a single day where there's no discussion between our ED leadership, myself, and the PSQ patient safety department. It's an ongoing basis. Even if we meet only monthly, I can say that, these discussions and the processes for improvement, they're discussed on a daily basis to make sure that we get better. That has been, really the daily reports of the previous day's sepsis patients that presented, very crucial for a more real-time pulse on what's going on in our emergency department in our septic patients.

Leah Meyer: This is Leah again. Just this year at SSM Health, we've implemented performance boards on each or our units. So, they take that daily data that's sent out each morning. They update their performance boards. They huddle as a team around that and they're able to catch some of those real-time interventions while the patient is still on the unit.

Candace Jackson: Wonderful. Our next question in the same topic: "I'm interested in hearing more about your Code Sepsis process particularly. Is it an RN, RT, rapid response with the primary care physician also responding, or does it involve a dedicated physician that responds to all Code Sepsis events with the other members of the code team?"

Alexandre Lacasse: Alex Lacasse again, very good, probably because I didn't say it clearly enough, but thank you for it. It is not a dedicated team. We rely either on nursing clinical suspicion or a best practice alert from our predictive tool to alert us if that patient actually is meeting a clinical picture of sepsis. When that alert comes, it goes also to the physician of record. So, there is an opportunity for communication between the nurse and the physician that receive those alerts. If the nurse receives the alerts, the instructions in

the workflow are to actually assess the patient. If the patient is unstable, then a rapid response can be called. If the patient is relatively stable, there's a 10-minute window where he or she would attempt to communicate with the primary providers. Most of our providers are hospital medicine internists. After 10 minutes, if there is no action plan from a physician, then the Code Sepsis can be called and usually is called on our overhead system. When that Code Sepsis is called, it is basically similar to a Code Blue or a Code Stroke or a Code MI that we have also in place at SSM. Therefore, people know this is an emergency. We have really put sepsis in the forefront of what we consider to be dealt with rapidly and not linger. So, in the Code Sepsis, based on different ministries' resources, we do have our treating nurse, our team leader, our pharmacist, our phlebotomy if we have, our vascular access team if the ministry has so, our hospitalists. If there's no hospitalist in house, we do have at some ministries, residents. We also have intensivists at other ministries that respond in person to the Code Sepsis. The pharmacists are very actively involved because when the order is placed, they know that this is for a septic patient. Therefore, in about 15 minutes usually the patient will have their antimicrobial drugs delivered and administered. Same goes for fluids and laboratory support.

Kimberly Izard: So, this is Kim. Just to tack onto what Dr. Lacasse just said, the inpatient Code Sepsis is a little bit different from our ED Code Sepsis. So, to answer part of that question, if it's an RN/RT, we do use our usual standard rapid response team to respond to a Code Sepsis on the inpatient side of life.

Candace Jackson: Wonderful, thank you. A couple of questions in regard to your daily data collection, and the questions are: "How does the daily data get collected and sent out, who does this, and what appears on those daily data emails?"

Avi Gandhi: This is Avi Gandhi. So, the first part of the question was, "How is the data collected?" We actually run a report off of Clarity or a Crystal Report, which is a part of Epic. We have an informatic team that has developed the tools that we needed in order to run the report. We then extract the data, and then we throw it into an Excel document. We have a distribution

list and we attach the Excel document with all of the results and then distribute it on a daily basis.

Kimberly Izard: Slide 28 shows the details about that.

Candace Jackson: Since we're on slide 28, we do have an additional question: "Holding providers accountable for using/not using sepsis ordersets helped improve its usage. Was any other method used to help improve these numbers?"

Paul Reading: This is Paul Reading. They are not required to use the orderset, but what we found was rather effective. We asked, "Why didn't you?" So, the follow-up question to the clinicians where we identify patients who clearly were admitted in sepsis and the orderset was not used is, "Why not?" So, we kept track of those "Why nots?" In some cases, it was very good clinical sense that the orderset wasn't used but, in other cases, it was, "Well, the antibiotic section is too complicated." or "I just used the order set to get the lab results expedited and various other things." So, it was very helpful to understand why a particular clinician did not do it; and, in other cases, it was like, "Well, we really didn't know it was there." or they weren't that familiar with it. So, there was education provided by either the emergency department director or the CMO, chief medical officer, and that really did boost the compliance, simply asking the question, "Why not?"

Candace Jackson: Thank you. We'll switch topics and have a couple questions on sepsis mortality. The first one is, "What is the definition of the denominator for your sepsis mortality, and do you only measure sepsis mortality on the SEP-1 core measure patient sample?"

Mario Schootman: Yes, that is in severe sepsis or septic shock patients only for the data that I analyze as part of the core measures.

Kimberly Izard: We actually look at all patients, not just those that were abstracted, in our sepsis mortality data.

Mario Schootman: So, that the result that I presented, it was just for severe sepsis and septic patients, but I consistently track all of them and not just those patients. We

set goals around that for the different ministries, then we define that and keep track of that on a monthly basis.

Candace Jackson: Then another question on that same line: "When measuring mortality, what definitions were you using? Is it anyone coded as severe sepsis and septic shock with the discharge code of expired?"

Speaker: Yes.

Speaker: Yes.

Candace Jackson: Our next question, back to our orderset, "We are very interested in your real-time feedback on use of sepsis ordersets in the ED. What criteria are you using in your Epic reports to identify patients admitted with sepsis, and how confident are you that you are capturing all of them?"

Speaker: I can take that. We rely on the additional diagnosis or the problem, the chief complaint that the patient was admitted under, to be sepsis-related; and we fully understand that there are patients who enter the facility with sepsis where it's not identified in the emergency department, and that's usually because the clinical picture is kind of cloudy. We get a fair number of abdominal pains, delirium, things like that, and we know we're going to miss those patients. So, going into the whole process, we understood that we were really only going to be looking at initially those patients where a physician had said this patient probably had sepsis. So, it was our starting point; it's not an all-inclusive measurement, if you will.

Candace Jackson: Thank you. We have time for one last question, and that question is, " Did you have any difficulty with physician and staff buy-in to the importance of sepsis recognition and treatment. If so, how did you overcome that obstacle?"

Leah Meyer: So, this is Leah. At a system level, we actually set reducing sepsis mortality and improving our sepsis process overall as a system initiative both last year and this year, and really in previous years. So, we've set that along with just a couple other priorities for clinical improvement. So, I think setting that all the way at the top of the system level and filtering

that down, and you've seen all of our approaches that we've used to infiltrate all of the sepsis improvements into all of our ministries, have really shown clinicians and front line staff just how big of a priority sepsis improvement is for our ministries. So, I think that's kind of where it starts, from the top down, and we've really seen folks at the front-line embrace that and be involved and active, and, Dr. Lacasse, I don't know if you have something to add.

Alexandre Lacasse: Yes. The culture at SSM is not a punitive one. We ask the "Why?" a lot, as Paul Reading was saying. So, we're very visible as a team at the ministries. We do have a process of what we call "sepsis rounding" led by our patient safety department, and this provides very direct feedback both ways on both education and feedback to improve our process. So, we do that in our emergency room. We do that in pretty much every floor of the hospital, and we keep track. For example, if we know that there was somewhat of an undesired outcome in a patient in a unit, we'll actually, obviously not real time, but we'll closely go do sepsis rounds and provide education. We tie that into education. We actually have a process where we ask about 15 or 16 questions that people picked just so people understand that sepsis is part of our quality measures and it's an emergency, just like any other disease as mentioned like MI, and CVA, and so forth.

Kimberly Izard: This is Kim. Just to add to that, many of our regions have what we call "sepsis summits" where clinicians, safety, quality, the data folks all come and we talk about our progress and what we can do to improve our care to our patients.

Shelley Powell: This is Shelley Powell. I'm just going to add on to some of the points that Kim just made and Leah mentioned. In the acknowledgement slide, I referred to Dr. Alex Garza, who was our chief medical officer. So, he's our executive champion. He sets the direction and the expectation for that being a key performance indicator and a key area of focus that Leah mentioned. So, his expectation, he communicates that on a regular basis to our chief medical officers and our chief nursing officers across the system that this is a priority and it continues to be a priority. We continue to set

goals this year. Going into 2020, we have goals, and then we do have a regular forum where those chief medical officers, the chief nursing officers, patient safety coordinators, sepsis coordinators, all of those team members come together and present the work that they've been doing and they ask questions of each other and they share best practices, so that continues to keep that on everyone's radar.

Candace Jackson: Wonderful, thank you. I know we did not get to everyone's questions today. So, if you do have additional questions for SSM Health, you can reach out to them at the references on slide 51. Next slide, please.

I'll just briefly go over our continuing education process.
Next slide, please.

Today's webinar had been approved for one CEU credit. For further guidance related to the CEU process, you can access the link that is provided on the slide. Next slide, please.

I would like to thank everyone for joining today and would like to give a special thank you for our speakers from SSM Health, and we hope you have a wonderful rest of your day.