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Welcome to your to conference call entitled Prevention of Surgical Site Infections a review of recent -- and guidelines. I am Jason and I will be your operator for today's call. At this time all participants are in a listen only mode. Later we will conduct a question-and-answer session. This conference is being recorded. I will now turn it over to Pat Gilbert.

Thank you and welcome to our event today. We are excited about the opportunity to present information on surgical and site infection prevention. This program is brought to you by the Great Plains QIN quality improvement organization, which serves North Dakota, Kansas, Nebraska and South Dakota. We're doing this in partnership with other QIO that serve a total of 14 different states. There will be a link to the handouts placed in the chat. We will be monitoring that today. If you have not received those already, Dr. Butler has shared those with us. In addition we will answer questions at the end of the presentation. -- Dale Bratzler . At this point in time it's my honor to introduce Dr. Dale Bratzler. [indiscernible]. Also professor in the College of medicine at the University of Oklahoma health science Center. He currently serves as the chief quality officer for Oklahoma University physicians. Recently assume the role of medical director of clinical skills education and testing center of the University of Oklahoma. Those of us in the QIO community remember him from his time as medical director and CEO at the Oklahoma foundation for medical quality. And those involved in quality improvement remember his role in the -- measures of surgical care improvement project. He has also been a recent member of healthcare infection control practices advisory committee, commonly referred to as HICPAC.

At this point in time I would like to welcome Dr. Dale Bratzler and thank you for sharing this information with all of us today.

All right, thank you, Peggy. It's really a pleasure to be here today. When I'm going to do over the next 45 minutes or so is review recent evidence of some of the guidelines had been published on prevention of surgical site infections. And I hope to leave sometime for questions at the end of my presentation. There are a few of the slides I think you have handouts for. I will go through them relatively quickly just to make a couple of points. As I get to the end, we will focus on those interventions to help us prevent surgical infections.

So I have no financial disclosures related to surgical site infection prevention. These are my objectives for the presentation today. I will review updates in recent guidelines for best practices. I will highlight some practical recommendations that have been development for acute care hospitals prioritizing surgical site intervention efforts. And last I will focus on this concept of

multi-mobile bundled approach to prevention of SSI which I think is becoming somewhat the standard of care in the United States to reduce risk of infection.

So very briefly if you read the compendium on surgical site infections you will see this information. Surgical site infection is still fairly common in the most common hospital acquired infection that occurs in the United States. When they occur they create substantial morbidity and mortality for patients, patients who die after surgery to have a surgical site infection, about three quarters of the time the death can be directly attributed to the surgical site infection. And they are very costly to view in the healthcare system.

I will not spend a lot of time on this slide, but I think it is important to highlight that there are some things that we know about and prevention of surgical infections and some we don't know enough about. Just remember there are many different factors that will create some additional risk for a patient to develop a surgical site infection. Things like host factors. Some of many of which are not in our control. We will talk later; if you have a patient with diabetes they clearly have a higher risk of surgical site infection. Emergency operations put patients at risk. Some are colonized with bacteria. We will talk about that but recognize that patients coming to the hospital with bacteria that colonized can put them at increased risk. There certainly are different types of risk is on the different types of operations. Those we will highlight in just a moment. Patients with colorectal surgery will have a higher infection rate than a person under elective knee replacement. And then there are those things we can call exogenous factors, related to the surgical team and hospitals, things we hope are within our control. Doing things like providing antimicrobial prophylaxis, screening for resistant organisms, controlling the operative environment and the number of people coming to the room. Avoiding razors and other things. These are things we can control but they clearly contribute to the risk of the surgical site infection.

Just very briefly, let's talk about a surgical incision. This is not particularly a good picture, but it is a picture that suggests that in the operating room you have a surgical wound. Well we know that there is no such thing as a sterile operating environment. So bacteria actually do fall into the wound from the air from ambient air. And we know if you have traffic through the operating room, it may increase the bacterial burden in the room. We know that certain types of operations to substantially increase the risk of bacteria getting into the world. If you open the colon in the operating room, that clearly increases the risk of contaminating the wound with bacteria. Believe it or not the surgical teams should bacteria and that is why the joint commission and others are very critical if they walk in as part of the site visit and see hair hanging out of a surgical mask or surgical attire. It's one of the reasons that we try to control the traffic in the operating room, because we know that the team itself will shed some bacteria. And then certainly more recently we know that anesthesiologist can contribute to surgical site infection. There's very good evidence that anesthesiologist going from room to room can transmit bacteria on their hands and actually has been good study showing that you can actually inject bacteria potentially even into IVs and other things and create surgical site infection. Some very nice work I have referenced on this slide.

So most of the time in the operating room some bacteria get into the wound. It's almost impossible if you don't have a completely sterile environment. And yet most patients don't get a

surgical site infection. So why is that? Certainly different operations have different documents. We talked about colorectal surgery, a lot more bacteria in a greater risk of infection. A be differences in surgical technique. It's been well the -- demonstrated that different surgeons have different techniques, and even doing the same operation on different patience or the same operation on similar patients, will have greater risk of infection based on the actual surgical technique. And we also know surgical wounds have varying degrees of severity.

The most important point I want to make is that most surgical site infections, most of them start in the operating room, when the wound is open. That's when the wound gets contaminated. You close bacteria in and in a moment we will highlight why it is why -- hearted prevent infection. Most patients don't get an infection because host defenses take care of the bacteria that contaminate the wound. We do certain things like dividing preoperative antimicrobials. We try to can go -- control glucose. Those things actually result in a surgical site infection.

This is an important concept that most of the infections start in the operating room. It will provide some of the background about why the upcoming CDC guidelines, we recommend that you don't do things like continue antibiotics after you close the wound. We will talk more about that.

This is a nice steady done in the 80s. It shows that you can actually put bacteria, S. aureus, on top of the surgical wound. Particular sutures in this particular study. The and about an hour after the wound is closed, it's almost impossible to contaminate the wound or infect the wound with external bacteria. The wound itself closes quickly. Most infection start when the wound is open to perhaps in the short time immediately after closure.

And finally, remember that once a surgical infection develops, it almost always requires drainage to take care of the infection. So once you have closed the wound, you basically have dead space. Avascular because we often come most places where there might be bleeding, it is hypoxic. The patient may be cold. And then you have this environment of intercessional fluid, glucose, blood, hemoglobin the other things that promote the curial growth. You have a perfect place for bacteria to grow if they're going to grow at that point where it as I mentioned often times we do things like both the, using cautery, to make an incision. That can actually result in even less blood flow into the it area of the world. That's why after surgery at the patient develops a surgical site infection, the majority of time you have to open the wound to drain it, because the antibiotics to treat the wound infection afterwards don't get there.

So that is the background. And I've already mentioned the risk of the surgical site infection tends to vary substantially raised on the operation being performed. This is data from NHSN a few years ago and it highlights the surgical site infection greater for colorectal surgery and you will see what the hip prosthesis or selective knee surgery. Where the risk of infection should be much lower. I will tell you that I believe these data reported to NHSN are fairly grossly underestimating the risk of surgical site infection or a variety of reasons. I will show you a couple of studies in colorectal surgery die like that. The first one is the study that was a study looking, comparing the use of sovereignty to Era Panama and. The point I want to make with this slide is the rate of surgical site infection, published in the journal, a very good vision of the organizations that have the risk of infection, around 25%. Similarly here's a recent surge -- study

published in 2015. Again this is out of Canada, showing the overall surgical site infection rates were 25% in this particular study. So again the risk of infection following colorectal surgery is substantial. We often underreport the surgical infections that occur.

I will not get on that soapbox, but we will spend time now talking about the development of national guidelines on prevention of surgical site infection. I had the distinct pleasure an opportunity to work on three different guidelines now of the multispecialty society selection of antimicrobial -- the Shake Company M and finally most recently the HICPAC guidelines that hopefully will be published in the very near future. The first guideline focuses on antimicrobial selection. What antibiotic to give when a patient is having surgery this is a multispecialty society guideline led by the American Society of health and performances. The society for epidemiology of American -- in surgical infection society. This guideline focus principally on selection of the antimicrobial prophylaxis. We did have a section called common principles. I just want to highlight a few of the things we mentioned in the guideline. First, antibiotics before surgery for almost any operation will reduce the risk of a surgical site infection. That doesn't mean we should give an antibiotic for every operation. Some operations the risk is so low. Or the consequences of an infection are so trivial, that it doesn't make sense to give an antibiotic for all operations. So it is important to remember that there are studies in virtually every type of operation that shows if you give me incision -- to risk, it reduces the site infection.

-- [indiscernible] the organizing most likely to cause a surgical site infection, you don't have to treat everything. We also explicitly recommend against routine use of vancomycin for prophylaxis. When you use vancomycin for prophylaxis you may increase the risk of kidney injury in some patients. So vancomycin should be limited to patients who are at risk for MRSA, colonization or a beta-lactam allergy. What you should use is colonized with some other drug resistant organism or -- studies. Here is a study that I mentioned fairly recent for 2015, in orthopedic surgery where they routinely were adding that, myosin to settle so in for prophylaxis. Vancomycin is not a good use and it does have some risk, the one to worry about the most is the resistance to vancomycin.

However sometimes it makes sense to give more than one antimicrobial. This is a study we published a few years ago. Looking at patients having coronary bypass surgery or hip or knee arthroplasty. We were surprised; this is data from the CDC national healthcare safety network. We were surprised that nationally when you look at reported surgical infections, 34% to fully a third of infections reported work -- negative. If you had a patient that was thought to be at high -- resistance of vancomycin for prophylaxis, you will not provide any protection for Graham negative organisms. One of the things we talk about is particularly if you have surgical infection surveillance data that shows you sometimes see -- infections, to consider giving to agents not one. Anytime you have to use something like vancomycin for prophylaxis. In most patients, vancomycin was indicated because of the risk. We would recommend that you add up those of several soul into it. -- Cefazolin. To it.

You something well -- every something else to provide additional protection.

Again I will highlight the guidelines include using -- including choosing wisely. -- Explicitly do not overuse Don beta-lactam and people with history of the assailant allergy. While 10% of the

population will come in and report their allergy to penicillin cut the studies show 90% of patients are not allergic to penicillin. 90% of those patients are not allergic to penicillin. So take a careful history before you pull the trigger on using non-beta-lactam's. They seem to be the best agents for surgical prophylaxis.

I will highlight cannot spend a lot of time, but in the multispecialty society guidelines we still recommend that it be administered 60 minutes prior to incision. You can start it within 120 minutes for vancomycin. Or for the incision there is a known consensus that it needs to be in the patient before the incision. You'd like to have enough in to exceed the minimum inhibitory concentration for the organisms likely to be contaminating the wound.

For weight-based dosing, there are not a lot of good studies out there. There are observational studies that show when you give doses of drugs such as cefazolin to obese patients, you can reduce the surgical site infections. The only three antibiotics which we could come up with relatively firm weight-based guidelines, for cefazolin 25 mg, gentamicin 5 mg -- no postoperative dosing. And similarly vancomycin, 15 mg per kilogram. Sometimes some cardiac programs are using 20. One time before the incision but no reducing.

How often should you redose the antimicrobial, only during the time that the operation is ongoing. If you're going to reduce the antimicrobial in the operating room you should do it about two half-lives of the drug. Cefazolin as an example has a half-light of about one -- eight hours. If you're still in the operating room, you need to reduce the patient in the operating room.

We recommended in the multispecialty society guideline that all men to be grow bills should be stopped within 24 hours for all operations. If you read the footnotes in the table it suggest a single dose of preadmission prophylaxis is probably adequate. We recommend against the use of topical antimicrobials. A few studies suggest some benefit but often times those studies haven't done a good job of controlling for things like --. If you give a big enough dose before the incision, it doesn't appear topical microbial -- antimicrobials [indiscernible]

And colorectal surgery, the guideline came out with a specific recommendation, if you're doing elective colorectal to surgery you should give mechanical bowel prep combined with a non-absorbable antibiotic. In addition to intravenous prophylaxis. A recent study has questioned the value of the mechanical bowel prep, but there's increasingly strong evidence that or I'm antimicrobials to make a difference in patients undergoing colorectal surgery. So again we will highlight we are not talking about skipping the parenteral antibiotic, were talking about oral antibiotic. Which reduces the risk of surgical site infection. I think if you look at several of the studies that have been published, the reduction of the infection rate is dramatic, very substantial.

Here's a study from the VA. In this particular study, they correlated the use of -- Macrobius with the reduce of surgical site infection. In those with colorectal surgery about 90% of the time had much lower rates of surgical site infections at a VA six --'s facility. This is a study from the Michigan group that basically showed that the rest of all surgical site infections were dramatically reduced, about 10% in patients that receive the full prep which in this study included the mechanical preparation in the oral antibiotics. Most answers we hear they also did

not see an increased risk of C. difficile. In patients had a shorter duration of ileus postoperatively.

And prescreening for staff oriented colonization. A couple of things we know if the patient is colonized with staff they are much more likely to get a surgical site infection due to staph aureus. In the guideline we specifically recommended that particularly in orthopedic surgery in the cardiac surgery, where the most studies have been published, that you consider prescreening the patient and if the patient is positive for staff aureus, that you decolonize the patient with mupirocin or more recent studies with -- iodine. And if the patient happen to be colonized with -- , and make a myosin to your surgical prophylaxis. A very nice study published just recently by Sweitzer from Iowa. That looked at a bubbled intervention, and a patient having cardiac knee and hip surgery. I was on the technical panel for this particular study and what they did, they looked at patients undergoing the orthopedic surgeries and they screened them preoperatively for staff aureus colonization. Again I am saying both MSSA and MRSA . If they were positive they got chlorhexidine bathing, and nasal application for five days. And they got cefazolin for surgical prophylaxis. And they still got perchloroethylene bathing -- CHT -- and if there's negative screens they got the routine preoperative data or chlorhexidine and cefazolin was used for the surgical prophylaxis. The results of the studies were quite significant and they demonstrated a fairly substantial reduction in the risk of surgical site infections, in these patients. There was one spite you will see in about July 2014, when they were doing a study, I'm sorry 2013. That was actually when they had a marked increase in noncompliance with the protocol.

In fact the risk of the complex staff aureus surgical site infection decreased significantly after operations performed by surgeons who were compliant with the protocol. As they broke the data out based on compliance, the surgical team not compliant with the protocol of the risk of the surgical site infection did not go down.

So that is a quick review of the multispecialty society guideline. Now I want to spend a few minutes talking about the HICPAC guideline . I'm happy to report as of this week it is actually in the CDC clearance process which is the final step before publication. Hopefully it will be out in the near future. This was a guideline that has taken us five years to write. It is very complex writing a CDC guideline. The core writing group at HAI -- HICPAC , we had the practice to the political literature reviews. With technical input from many specialty societies and experts nationally was surgical infection prevention

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We be viewed a lot of articles, around 5200 studies. We did full titled abstract review. A lot of studies were excluded because they were not controlled. Subsequently I will go to the bottom of the slide and highlight there were only 133 studies that had high-quality evidence in the core section and arthroplasty section of the guidance. We did do a second literature review because it was taking so long to do the guideline. We identified another 500 abstracts. Two of us went through all of the text and we found another 62 articles that were high-quality, randomized controlled trials we could use to supplement the guideline. Let me give you a quick overview of what the guidelines said.

We did do a very detailed analysis of all of the studies. One thing that we will highlight is we look carefully at meta-analysis. We had all sorts of problems with meta-analyses because

although they may have been done tactically correctly, when you looked at the individual study, in the meta-analyses we often found evidence that the studies that were included did not include standard practices related to prevention of surgical site infection. We had the look at all of the medical analyses best meta-analyses for making the guideline.

The recommendations for this methodology, a category -- Category 1A is always strongly recommended . A well-designed experimental clinical or epidemiologic study. Category II is poor quality evidence. No strong evidence sadly for surgical infection prevention. These are the key topics we addressed in the guideline. We focused on a course section of antimicrobial prophylaxis. We did not look at selection which was covered in the multispecialty guideline. We looked at glycemic control, keeping patients warm, giving supplemental oxygen, and skin preparation. In the arthroplasty suction with the transfusion, immunosuppressive therapy, anticoagulation, orthopedic exhaust, antimicrobial prophylaxis duration with drains and biofilm. Let me summarize the key findings. Category 1B, and minister preoperative antimicrobial agents only when indicated based on published clinical practice guidelines and timed such you are bacteria sidle concentration of the agents when the incision is made. It doesn't say you have to have the entire -- you just want enough in to exceed where it's likely to cause an infection.

For cesarean section we found high-quality evidence, when the moon controlled trials, by giving the antimicrobial agent before the skin incision and not waiting the way we used to until the umbilical cord was clamped. Subcategory -- Category 1A can't give the antimicrobial before the and Syrian -- incision for cesarean section.

We could not make any recommendations for weight. The reason we did this and no recommendation is because there are no published randomized controlled trials. If you look at the guideline, it will say or highlight that other guidelines to recommend that you wait to adjust dosing and give interoperate is we dosing. There were no published randomized controlled trials.

Here is one where there are many many randomized controlled trials. We found more than almost 15 randomized controlled trials. But there's no benefit in giving antibiotics after you close the incision. We did give that a Category 1A recommendation , to stop the antibiotics when you close the incision. Give preoperative doses and if you need to redose in the operating room, but once the room and is closed -- the wind is closed do not give additional doses.

What about blood sugar control. We spent a lot on this recently. We give a strong Category 1A recommendation for controlling blood sugar. We had lots of discussion about the best target blood sugar. We settled on 2 mg/dL.

But there's not good consensus on what the target should be. Certainly we don't want patients postoperatively having blood sugars at 300 or 400. We targeted keeping it less than 200 mg/dL. Some studies would suggest 180 or 140 is better target. Those are observational studies and we couldn't make any firm recommendation.

Is a very nice meta-analysis just published by Emily Martin in a group out of Michigan that looked at diabetes in the risk of surgical site infection. There's also a nice review of this paper published in Medscape. And basically just having a diagnosis of diabetes substantially increase

the risk of the surgical site infection, cardiac surgery doubled the risk. For most other operations, a 60% increase, spinal, 60% increase you

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Many of these studies find an increase in surgical site infection based on the diagnosis of diabetes, and if you will see in the Medscape article, it is probably the blood sugar, the diagnosis of diabetes is a marker for patients with hypoglycemia -- hyperglycemia.

About keeping patients warm, we gave this a Category 1A recommendation. We don't know the best strategy to keep patients warm. We don't know how long you should do it but certainly while the patient is in the operating room we gave it category one a recommendation to keep the patient warm in the operating room. The American Society of anesthesiology targets a temperature of at least 35.5.

Oxygenation, this is a bit more complex. There are studies that show call random trials that show giving supplemental oxygen to patients after surgery, either during the operation and after surgery can reduce the risk of surgical infection. You have to look at those studies carefully. Most of those studies or in patients that had general anesthesia and into tracheal intubation. What we basically saying the guideline is that if you have a patient with normal pulmonary function undergoing general anesthesia with endotracheal intubation, and administered increase fraction of inspired oxygen, FiO2, both in upwardly and post extubation in the immediate postoperative period. To optimize tissue oxygen delivery, maintain part perioperative normothermia an adequate volume replacement. In the guidelines we did not say what the best target was, what FiO2 you should use , most of them used 80% and often kept them on oxygen for at least two hours postoperatively.

What about antiseptic prophylaxis. This is controversial because it is not consistent with some of the bundles around the nation. Basically we give a category 1B. To have the patient shower or bathe with either so or antiseptic agent on at least the night before the operative day. We did not find good randomizes control of the use of certain agents like --. Were any better than just using soap. For preoperative days. I know there are bundles up there that promotes the use of fluoxetine. I don't think that harms anything, we just did not find any evidence that was better.

What about in her operative skin preparation, Category 1A , a strong recommendation. Without call in it. -- Alcohol in it. An iodine prep that has alcohol in it compared to chlorhexidine alcohol, the guideline would get a Category 1A recommendation to use some alcohol. Remember you cannot use alcohol in all patients, particularly if they have, if you're operating close to the hair because you cannot get the alcohol dry and there's a fire risk.

We did not find very good evidence about the use of these antimicrobial sealants. Following in her operative skin prep. The sealants that you put on the skin to try to glue down the bacteria. Not much good evidence there. There was a little bit of evidence on in her operative irrigation of the deeper subcutaneous tissues with AQS either for solution -- Iota for solution. For the abdominal wound or for spinal surgery, but not the intraperitoneal cavity and for dirty and contaminated operation. A very weak recommendation there also.

There are all sorts of things in the guidelines that will come out as no recommendation or unresolved issues. They include things like what is the best weight-based antimicrobial dosing regimen. In her operative we dosing, irrigation, what about soaking prosthetic devices. What is the value of a 1C. In every one of the orthopedic questions that we looked at, there was no good either randomized trial and we also looked at observation studies. I did not find strong evidence for any of the practices. The only orthopedic practice for which we found strong evidence was to stop the antibiotics when you close the wound.

I will get to this one controversy very briefly. That was about should you use these antimicrobial coded sutures. The most common agent is triclosan. I would say this is quite controversy all. When we first wrote the guideline and 2013, the one recommendation was not to use the sutures. Subsequently by December 2014 we said that one day recommendation to use them for colorectal. And finally the recommendation at that time, mid-2015, was use of coded sutures, if they are available in a Category 1A recommendation . However, I will tell you first there is very good evidence that sutures contaminated and colonized with bacteria, a very nice study in 2009, in morbidly obese patients. Emergency operations. And persistently training, six months after surgery, and finally they reopen the wound and found non-absorbable sutures used during the operation. When they looked at them under electronic microscopy, they found within the center itself, a braided suture, they found colonized teeming with bacteria. So clearly sutures can become colonized bacteria. The problem was, when we looked at the quality of the studies on triclosan coded sutures come many of those studies again did not control for other things that most of us would consider standard of care for prevention of surgical site infection. And I have to say that the committee was mostly influenced by very well done studies that came out of Europe that controlled everything including skin prep. Prophylaxis with an microbial's. They actually made them send in the suture packets. They use the same type of suture both monofilament's on the control arm in the coded arm. They found no difference in surgical site infection rates. So we gave a category two recommendation, to consider using triclosan coded sutures for the surgical site infection prevention. We did not find any studies that showed any harm in using them. But in the better studies, the wound construe studies, we did not find huge data.

Let me end with just a couple of comments about the bundled approach to prevention of surgical site infection did there is growing consensus as many of you probably are aware, one intervention to prevent surgical site infection is it going to reduce your rates are just getting into political real prophylaxis is helpful -- antimicrobial prophylaxis is helpful but not enough. We did a study in 2005 looking at the bundled approach that included antimicrobial agent selection, appropriate timing and duration, keeping the patient warm and oxygenated, keeping the blood sugar low, appropriate hair removal. In that study we saw about 27% reduction in the risk of surgical site infection. There have been other studies published. One of the better ones that was published in 2013 was again out of the Michigan group., With a nice bundled intervention to reduce surgical site infection. They had six interventions they looked at and they included appropriate antibiotic solution -- selection. Keeping the patient warm, giving the oral antibiotic with the mechanical bowel prep. Keeping the blood sugar, a targeted 140 mg. Minimally invasive surgery when feasible. And keeping the operative duration short. The longer the operation the greater the risk of surgical site infection.

These were the six interventions. What they showed was if you did all six things, the risk in colorectal surgery of the surgical site infection was only 2%. Incredibly low rate. But if you are only able to do one thing, as part of the bundle, the infection rate was 78.5%. So this is one of the better designed studies, looking at the bundled approach to surgical site infection.

Let me end by mentioning this a continuum. The Shea continuum. It will have more recommendations. That is because it was not limited to randomized controlled trials. The Shea compendium looked at both observational study and we also then where there were not good studies had expert opinion were possible. You will simply see additional recommendations in the Shea compendium on strategies to prevent surgical site infection. It was updated in 2014 and I strongly encourage you to look at it. As you are thinking about what bundled approach is you might take in your facility to reduce the risk of surgical site infection. Let me end by saying there are surgical site infections in hospitals reported in the United States. The risk is considerably higher than we see reported in the NHSN . There are several different operating type and several may not be within your control. And finally no single intervention is going to be sufficient to prevent surgical site infection. It is probably going to take multifaceted intervention in the bundled approach is getting strong evidence now for prevention of surgical site infections. I will stop at this point and take any questions.

Thank you. We will now begin the question-and-answer section. If you have a question press star and one on your touchtone phone. To be removed from the queue press the pound signed. If you're using a speaker sign -- speakerphone pick up the handset first. If you have a question press star than one on your touchtone phone.

Will quickly, I saw one in the chat room about blood loss. Not great studies looking at reducing based on blood loss. But I think it is common practice, again for the most part when you're using -- like cefazolin they are very safe. If you have a patient that has substantial blood loss during an operation, then re-dosing with antimicrobials is probably acceptable. It poses little risk to the patient for most antibiotics.

Thank you, we have a question from Megan Cyprus.

That is me. Joanne Harris. We have an ongoing question about when you're giving prophylactic antibiotics, I know you mentioned in your talk, when you can actually do the incision. And when you say this is appropriate tissue level of antibiotics. We come across this more with -- penicillin allergic patients than with cefazolin cup because it is a longer administration time. What is your opinion about the duration of administration of the antibiotic prior to the incision?

That is a great question. One that comes up frequently. I will highlight, such as cefazolin that you can give it quickly. Some facilities actually given IV push. You can give it in 35 minutes if you push it. Such as vancomycin, where the infusion time is longer, how much needs to be in before the decision -- incision. There is no good studies published. The best study I have seen was from a number of years ago in cardiac surgery. What they demonstrated in that study was the infection rate was lowest in that study when the vancomycin was started in the timeframe between 15 minutes in 60 minutes before the incision. Many of the patients not having complete infusions at the time of the surgery. There's no evidence the entire dose has to be in, and the surgeons tell me

they are condensed that the risk of one contamination and wound infection is not linear. In fact, at the start of the operation, when you first are making the incision, it is usually very vascular. The wound is not cold, you have good lead flow. Risk of infection may be lower at the first part of the operation that if you contaminate the wound with bacteria at the end of the operation. When now you have got decreased blood flow, often times hypoxia of the wound. Things that reduce the ability to fight off infection. I can only tell you there is no great studies. But the best one I have seen showed vancomycin started anywhere from 15 minutes to 60 minutes before the incision, the infection rate is more than giving them earlier. I think get some and that many of the surgeons I work with on this project are certainly comfortable as long as the antimicrobial is running when the incision is made.

Thank you.

Once again if you have a question please press star than one. Our next question is from John it.

Hello Dale. Any evidence at all dealing with the influence that residence and teaching programs might have on surgical infection? We struggle with understanding the importance of attending presence, surgical length of time, inadequacy of teaching.

John it's good to hear your voice, it's been a while. So I can't quote any studies offhand. I think there are a couple of things we know about surgical site infection. The longer the duration of the operation the greater risk of the surgical site infection. Often times and teaching programs that is one of the things you see the duration of the operation is longer. Also in academic centers to whether his teaching, you will have more traffic through the operating room, more people in the room, that seems to be potentially a risk factor for increasing the risk of the surgical site infection. There are some great studies, a very nice one in the Journal of -- New England Journal of Medicine looking at surgical technique. Just demonstrating that you can, if you watch surgeons or watch videotape of surgeons, some are very good at tissue handling, very delicate in the operation. In some are not particularly adept at it. That probably has some influence on rates of surgical site infection. And finally a number of observational studies that show believe it or not, some surgeons have higher infection rates than others, that so -- that don't seem to go away when you -- for the severity of illness or the type of operation performed. House staff are trained in learning during surgeries it may make the surgery longer, they may not have the skills to the technique of tissue handling that may be very important to reducing the injury to the tissue that might risk higher rates of surgical infection. I cannot quote specific studies but I think there's a lot of reasons to think in a teaching program potentially other may be greater risk of surgical infection. More people in the room or less skilled hands during the operation.

Thank you. We have no further questions in the queue.

I see one question in the chat about patient temperature. What is the recommendation for minimum temperature ? I believe the American medical Society in anesthesiology has targeted keeping the patient at least 35.5°C. There is no accommodation about the room temperature. I know that is talked about often. It turns out most of the heat loss that occurs in the operating room is not because of the room temperature. So some of the surgeons say you don't want me sweating and tripping into the wind. So yes, many times operating rooms you keep cooler

because the surgeons are in letdowns or drapes. Things that will keep them warmer. But there is not a huge amount of evidence on the risk of surgical site infection, specifically related to the operating room temperature. That may not be true and kids or infants were there may be more susceptibility to environmental cooling. The big thing is whatever operative technique you use, their huggers or mattresses on operating tables, warming fluids, to target keeping the patient warm in the operating room. 35.5 is the target I believe, the minimum.

Dr. there are also questions further up. I will read them to you. Despite the surgical Brendan -- bundles, we have infections without any common --

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It is a little difficult to know exactly what is going on. The bundled approach I think is very important, I would ask you to remember the study by Schweitzer. They demonstrated the bundle compliance is also very important because you implemented the bundle, are they actually implementing all aspects of the Bible. For colorectal surgery iso--- strongly recommend the use of antimicrobials in addition to wait-based preoperative dosing. When the common things we see is that antimicrobials are under dosed pre-incision. And if the operation is relatively long, remember some of the antimicrobials being used have very short half-life. Cefazolin is only 1.8 hours. I would be liberal will with the dosing in the operating room. I would also look at your surgical site infection surveillance and see what organisms are causing the infection. Maybe you need to adjust your antimicrobials used on the types of infections you are seeing. I would not continue antibiotics post incision -- wound closure. That may just drive the resistance. But really focus on the things upfront that make the biggest difference. Consider oxygenation. I don't know if your anesthesiologist have taken that on, but consider hyper oxygen as an additional approach. The other one we found in Michigan studies, one of the things that is commonly not been well is -- control. Hypoglycemia -- hyperglycemia, glucose control, leads to surgical site infections.

I think we have time for a couple more questions. Another is what is the role of will fax surgical site infections. That surgeons are placing over closed incisions.

I honestly don't know that I have ever seen a steady that truly compared surgical site infections with or without wound --. I mentioned before, certainly if you had somebody losing, but in the wound, it would increase the risk of surgical site infection. In that circumstance you can see it might be useful. I have not seen the randomized trials showing it made a big difference. That was not one of the questions we addressed in any of the guidelines.

Thank you. Another question. What is the role of transparent dressings left in place over incisions for days without changing.

Actually, there are some very nice reviews on dressings showing it almost doesn't matter what you use. Again, the reason I showed that old slide, 1980 was that one should close the wound, the wound actually closes over it so fairly rapidly. Most of the time we put dressings on primarily to protect the wound from abrasion or other things that might injure, or potentially reopen the wound. In the analysis they found no difference in infection rates based on any type of dressing used to whether antimicrobial, silver, plane. The recommendation was to use the least expensive you can find. I don't know of any strong rationale to pick one dressing over another. In large part of surgeon preference. But the wound itself in those patients closes over very quickly.

What is your perspective on probiotics taken before colorectal surgery, a week prior to

We actually talked about that a little bit. We did not find any studies showing a reduction of risk of surgical site infection. I know people are using probiotics primarily to reduce the risk of C. difficile infection. That's why I highlighted it in the Michigan bundle approach study. They look at mechanical prep along with -- oral because one of the complications we are worried about, will we read -- increase the C. difficile rates. In the actual C. difficile rates were lower. Partly because of the non-observables -- -- absorbed. [indiscernible]

What are your thoughts of their huggers contaminating the incision by constricting the airflow in the room.

That has been a popular topic, in part promoted by a company that sells a competing product. There is no evidence that I'm aware of that it causes increased risk of surgical site infection. Most wounds get contaminated, if you culture wounds in the operating room, most get contaminated. But most studies with the forced warm air devices like their huggers actually show reduction of surgical site infections because your keeping the patient warm.

Very good Thank you. We are past 3:00 PM. I'm wondering if you would like to field more questions? Or I can forward them on to you.

That's completely up to you.

All right. Let's do a couple more questions. What is your thought on using a closing tray in class to or higher surgeries?

It's been a while but I did look at the study using a closing tray. The concept here is to use a set of instruments that have not been contaminated during the operation, completely separate, sterile tray for closure. I honestly, it's been a while since I read it, but I don't think that particular study showed a marked reduction in surgical site infection rates. I understand the rationale to not use instruments for closure that have already potentially been contaminated. Particularly in colorectal surgery where you may get into the bowel. I would have to go back and do some research on that topic. I've seen a couple of papers on it. None stand out in my mind that showed me any dramatic reductions. In surgical site infection rates. But I understand the rationale of studying the question.

Okay the final question, I would like to know if CHG 0.5% versus saline or antibiotic arrogant -- not a complete sentence.

In general, we did not find evidence of use of topical and micro bills or antiseptics -- antimicrobials or antiseptics -- a little on code own iodine. Not in the cavity, not intraperitoneal but they wound itself, I actually had this question post by a hospital not long ago. I highlighted that frankly irrigation is good to wash out bacteria in any debris left in the wound. And sterile saline is probably as good. In the guideline you will see we explicitly recommend against the use

of antimicrobials. Only on -- iodine for the irrigation of the wound. Frankly I don't remember that we saw any randomized trials with poor exiting in the irrigation solution.

This is pagan I think we need to say thank you very much to Dr. Dale Bratzler for the information . Explaining the difference in the guidelines. I look forward to seeing the new when it is released peers

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Thank you ladies and gentlemen. This concludes today's conference call thank you for participating. You may now disconnect. Speaker stand by for your post conference.

[Event concluded]