



eLITERATURE REVIEW

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Featured Cases: Update on *Staphylococcus aureus*

Our Guest Author is Sara Cosgrove, Associate Professor at Johns Hopkins University School of Medicine

At the conclusion of this audio activity, participants should be able to:

- Describe current treatment options for *Staph aureus* bacteremia
- Evaluate the risks and benefits of decolonization of hospitalized patients colonized with MSSA and MRSA
- Discuss the role of decolonization in the management of recurrent CA-MRSA infections

This discussion, offered as a downloadable audio file and companion transcript, covers the important issues related to *Staphylococcus aureus* in the format of case-study scenarios for the clinical practice. This program is a follow up to the March 2010 eInfections Review newsletter—[Update on *Staphylococcus aureus*](#).

Unlabeled/Unapproved Uses: The author has indicated that this presentation will include off-label discussions of daptomycin.

MEET THE AUTHOR



Sara E. Cosgrove, MD, MS
Associate Professor of Medicine
Division of Infectious Diseases
Director, Antibiotic Management Program
Associate Hospital Epidemiologist
The Johns Hopkins University
School of Medicine
Baltimore, Maryland

Faculty Disclosure

Sara E. Cosgrove, MD, MS, has disclosed that she has received grants or research support from Astellas, Cubist, and AdvanDX and served as a consultant for Theravance/Astellas, Forest and Merck.

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PROGRAM DIRECTORS

Paul G. Auwaerter, MD
Associate Professor of Medicine
Clinical Director, Division of
Infectious Diseases and General
Internal Medicine
The Johns Hopkins University
School of Medicine
Baltimore, MD

John G. Bartlett, MD
Professor of Medicine
Department of Medicine
The Johns Hopkins University
School of Medicine
Baltimore, MD

Sara E. Cosgrove, MD, MS
Associate Professor of Medicine
Division of Infectious Diseases
Director, Antibiotic Management
Program
Associate Hospital Epidemiologist
The Johns Hopkins University
School of Medicine
Baltimore, MD

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MR. BOB BUSKER: Welcome to this eInfections Review™ podcast.

eInfections Review™ is presented by The Johns Hopkins University School of Medicine. This program is supported by an educational grant from AstraZeneca, Cubist Pharmaceuticals and ViroPharma.

Today's program is a follow-up to the March 2010 eInfections Review topic: Update on *Staphylococcus aureus*.

Our guest is Dr. Sara Cosgrove from Johns Hopkins University.

This activity has been developed for primary care physicians, internists and infectious disease specialists caring for patients with infectious disease conditions. There are no fees or prerequisites for this activity.

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- Describe current treatment options for *Staph aureus* bacteremia;
- Evaluate the risks and benefits of decolonization of hospitalized patients colonized with MSSA and MRSA; and
- Discuss the role of decolonization in the management of recurrent CA-MRSA infections.

I'm **BOB BUSKER**, Managing Editor of *eInfections Review*.

On the line we have with us Dr. Sara Cosgrove, an Associate Professor of Medicine in the Division of Infectious Diseases at The Johns Hopkins University School of Medicine in Baltimore, Maryland.

Doctor Cosgrove has disclosed that her relevant relationships with commercial supporters are that she has received grants of research support from Astellas

Pharma, Cubist Pharmaceuticals, and AdvanDX. She has also served as a consultant for Theravance/Astellas, Forest Pharmaceuticals, and Merck.

Her presentation today will include off label discussions on daptomycin.

MR. BUSKER: Doctor Cosgrove, welcome to this eInfections Review Podcast.

DR. SARA COSGROVE Thank you, I'm glad to be here today.

MR. BUSKER: To help expand our understanding of *Staph aureus* infection, we've asked Dr. Cosgrove to discuss some typical case scenarios. So if you would, Dr. Cosgrove, please present our first case, to address the issue of current treatment options for *Staph aureus* bacteremia.

DR. COSGROVE: Our first case today is that of a 42 year old man with active intravenous drug use who is admitted after presenting to the emergency room with four days of subjective fever, chills, myalgia and fatigue. On admission, he's febrile to 102 degrees, his heart rate is 100, and his blood pressure is 135/82. He reports daily injection drug use over the last month. Eight hours after admission, the microbiology laboratory notifies you that blood cultures from admission are growing gram positive cocci in clusters. He has no known history of MRSA infection or colonization.

MR. BUSKER: Based on what you've just described and particularly since this is an IV drug user, what would be the appropriate empiric antibiotic therapy for this patient?

DR. COSGROVE: In an injection drug user, the main concern is *S. aureus* bacteremia and very likely endocarditis, either involving the right heart valve or left heart valve, or possibly even both.

So it is appropriate to give empiric therapy once you find out that blood cultures are growing, within 8 hours, gram positive cocci in clusters. That is most likely going to be *S. aureus*, although it is certainly possible that it could be a coagulase negative staph.

In making a decision about what kind of empiric therapy to give, it is important to understand, in your

area of practice, how much MRSA is circulating. At this point in 2010, most areas in the United States are seeing at least some degree of MRSA infection inside and outside of the hospital.

In this particular patient who is an injection drug user, we generally tend to see high rates of MRSA. So even though this person has no known history of MRSA infection or colonization, just by virtue of being an injection drug user is at significant risk for having this bloodstream infection caused by MRSA.

In other cases it may be a little more difficult to know whether the patient is at risk for MRSA. It has been difficult, in clinical studies that have addressed this question, to really make the decision correctly. There was a study this year from Duke that shows that even in a tertiary medical center, there is still a fair number of patients who are getting suboptimal empiric therapy for MRSA. So it may be that the safest approach at this point, unless you really know that you don't have a lot of MRSA in your environment, is to use vancomycin for empiric therapy.

Another issue that comes up in some medical centers is whether there is a reason to give both vancomycin and anti-staphylococcal penicillin at the same time. There is pretty good data that outcomes with MSSA, bacteremia and endocarditis are better when patients are treated with anti-staphylococcal penicillins compared to vancomycin.

So some people think, well why not give both because I'll expose the patient to the anti-staphylococcal penicillin up front, and if they do indeed have MSSA, that might improve the outcome.

MR. BUSKER: Is there an evidence basis supporting that notion?

DR. COSGROVE: Currently we don't really have a lot of knowledge about whether that hypothesis is true. Some have brought up concern that there could be antagonism if you used vancomycin and an anti-staphylococcal penicillin together in the same patient, and a recent study from Boston looked at this question in some in vitro time-kill studies. In that study they did not find any evidence of either antagonism or synergy between the two drugs.

So at least from a pharmacokinetic standpoint, it is probably safe to give vancomycin and a semi-synthetic penicillin together, although from an antimicrobial

stewardship standpoint you're exposing the patient to potentially more drug toxicity when using two drugs together. Some people may just choose to go with regular vancomycin without adding the anti-staphylococcal penicillin. That is, indeed, what we do at our institution.

MR. BUSKER: I want to note to our listeners that links to the studies Dr. Cosgrove has referred to can be accessed in the transcript version of this podcast.

Now, back to this patient, Dr. Cosgrove. The lab has reported that the gram positive cocci in this case is indeed MRSA. How does that impact the antibiotic choice?

DR. COSGROVE: So if the decision was made to initiate both vancomycin and anti-staphylococcal penicillin, at this point you can obviously discontinue the anti-staphylococcal penicillin because that does not have any additive benefit in the treatment of MRSA.

The next decision is whether to continue vancomycin or other agents for the treatment of this MRSA bacteremia. Vancomycin is really still considered the first line therapy for MRSA bacteremia and, therefore, most in this setting would continue the patient on vancomycin.

MR. BUSKER: In the newsletter, you discussed recently published guidelines about the use of vancomycin. Would you briefly review those for us?

DR. COSGROVE: First, the recommended goal trough of vancomycin for patients with MRSA bacteremia, endocarditis or other severe MRSA infection, is now 15 to 20 micrograms per milliliter. This is a change from some previous guidelines that suggested that 10 to 15 micrograms per milliliter a goal trough would be acceptable, and now recommend higher doses of vancomycin.

In addition, the guidelines recommend considering a loading dose of 25 to 30 milligrams per kilogram in patients who are critically ill or have severe infections, as has this patient with *S. aureus* bacteremia and presumed endocarditis. So in this patient we would be thinking of doing a loading dose of vancomycin and making sure that our troughs are in the 15 to 20 range.

The laboratory should also be able to tell us what the MIC of vancomycin is for this organism. There have been some recent studies that have suggested that patients who have MRSA infections with vancomycin MICs of 2 are at risk for worse outcomes than patients with MICs of less than 2. This is likely because it is very difficult to achieve vancomycin levels to kill MRSA isolates that have MICs of 2.

So if the patient is found to have an MIC of 2, at that point it is worth considering whether to change to a different agent besides vancomycin.

If the patient is doing very well and has responded to therapy, the blood cultures have cleared, the patient has no evidence of metastatic spread of infection and the MIC is 2, then it's probably reasonable to continue the vancomycin. But in our experience, that is usually not the case in patients who have MICs of 2.

MR. BUSKER: So what would be some of the alternatives to vancomycin?

DR. COSGROVE: Well the one FDA approved alternative to vancomycin is daptomycin. It is currently FDA approved for *S. aureus* bacteremia and right-sided endocarditis and the dose for which it was approved is 6 milligrams per kilogram, once daily, in patients who have normal renal function.

In that study there was some evidence that emergence of resistance during therapy occurred to daptomycin, and a lot of folks are now considering using higher doses of daptomycin when treating serious MRSA infection like bacteremia and endocarditis.

We don't have very much efficacy data on whether higher doses of daptomycin prevent emergence of resistance or yield better outcomes compared to the more standard 6 milligram per kilogram dosing strategy. There are hopefully some studies in the pipeline that might assist us with this question, but these are not currently available. Nonetheless, I think several experts do have a gut sense that higher doses are advisable.

MR. BUSKER: What are the concerns about using higher doses of daptomycin?

DR. COSGROVE: One important issue with regard to higher doses of daptomycin is whether it is safe. The main toxicity of daptomycin that was observed in clinical trials was muscle toxicity, and that could

be manifested by an increase in CPK levels or a frank myositis.

This doesn't happen commonly at a dose of 6 milligrams per kilogram, although it is advised that patients have a baseline CPK checked and have their CPK monitored at least once a week. We now know from some case series that have been published this past year that the incidence of CPK elevation also does not appear to be high in patients who do receive these higher doses of daptomycin. At doses ranging between 8 and 12 milligrams per kilogram, there were not significantly increased incidences of myositis or even CPK elevations in the case series that exists.

So we generally believe that higher dose daptomycin is safe to give as long as one is careful in asking the patient about symptoms of muscle toxicity, and making sure that their CPK gets checked at least once a week.

MR. BUSKER: What other agents should clinicians be aware of?

DR. COSGROVE: I think at this point it is important to mention a new drug with activity against MRSA that has come on the market. This drug is telavancin and it was recently FDA approved for treatment of skin and skin structure infections.

Telavancin is derivative of vancomycin and it is in a drug class called lipoglycopeptides. For skin and skin structure infections it was studied at 10 milligrams per kilogram daily compared to vancomycin at 1 gram IV Q12 hours. Vancomycin doses were allowed to be adjusted in this study of skin and skin structure infections and Telavancin was found to be noninferior to vancomycin and on that basis obtained FDA approval.

There are currently studies looking at the use of telavancin in hospital acquired pneumonia, but the FDA has not yet issued a statement of approval for its use for that indication.

So although we do have this new drug, and it's quite intriguing that it has a bactericidal effect against MRSA, we have absolutely no data on its use in MRSA bacteremia or endocarditis. Consequently, at this point in time, except a case of extreme salvage, we cannot recommend the use of telavancin for MRSA bacteremia or endocarditis.

MR. BUSKER: So bottom line, Dr. Cosgrove your advice to clinicians?

DR. COSGROVE: If you are experiencing difficulties in treating a patient with MRSA bacteremia or endocarditis because the patient seems not to be responding to vancomycin or has toxicity to vancomycin, it is likely advisable at this point in time to get an infectious disease consult to help with salvage regimens. Also highlighted in the newsletter are a couple of papers that do suggest that an ID consultation improves outcomes in patients with *S. aureus* bacteremia.

MR. BUSKER: I'd like us to stay with this patient for a moment, and pose a "what if" question. If the lab had reported this as MSSA instead of MRSA, how would that change the most appropriate antibiotic choice?

DR. COSGROVE: In that situation it is completely the opposite. At this point you would want to discontinue the vancomycin and continue the anti-staphylococcal penicillin. This is an important point to make because as I mentioned previously, outcomes in patients who have MSSA and who are treated with vancomycin are worse than those patients who are treated with anti-staphylococcal penicillins.

Often it is tempting to use vancomycin in patients with MSSA bacteremia because of the dosing strategy of twice daily dosing, or even more commonly in patients with dialysis who can receive vancomycin at dialysis. But we have to remember that this is really not in the best interest of patients. We need to treat MSSA with drugs that are very good for treating MSSA, and these are the anti-staphylococcal penicillins.

We often come into the problem of patients who have a penicillin allergy. In patients who have penicillin allergies along the lines of a rash or something that does not sound like an anaphylactic reaction, it is certainly reasonable to consider using cefazolin rather than going straight to vancomycin or daptomycin.

There have been some studies that have looked at the use of cefazolin relative to vancomycin, in particular a study that looked at this approach in dialysis patients, and found that the use of cefazolin in dialysis patients with MSSA infections led to better outcomes than the use of vancomycin in dialysis patients.

MR. BUSKER: And cefazolin dosing?

DR. COSGROVE: Cefazolin is actually pretty easy to dose in the dialysis patients because it can be dosed after dialysis, and if dialysis is to happen two days later, you can give 2 grams, and if dialysis is to happen three days later, you can give 3 grams. So that can be a nice alternative to the use of anti-staphylococcal penicillins which are not renally cleared and therefore are used with normal dosing in patients on dialysis.

There was a paper published this year that looked at a small number of patients with MSSA infection who failed cefazolin therapy. There was some suggestion that a certain type of production of beta-lactamase was related to this kind of therapeutic failure. Unfortunately, conventional microbiology labs do not have a way of detecting this potential risk factor for cefazolin failure, and in truth, it's existence shouldn't make us not use cefazolin but rather remind us that if we are using cefazolin we need to make sure that patients are responding to therapy. And if there's a question that they are not, for example, if they're having fevers, increased back pain, or other symptoms that an active infection may be not cured, then some additional evaluation is required.

MR. BUSKER: And we will return in just a moment, with Dr. Sara Cosgrove from Johns Hopkins.

DR. JOHN BARTLETT: Hello. I'm John Bartlett from the Division of Infectious Diseases at The Johns Hopkins University School of Medicine. I'm one of the Program Directors for eInfections review. eInfections Review is a combination newsletter and podcast program delivered via e-mail to subscribers. Newsletters are published every other month. Each issue reviews current literature in areas of importance to infectious disease specialists, primary care physicians and other clinicians caring for patients with infectious diseases. These podcasts, which are available as downloadable transcripts, provide case-based scenarios to help bring new information into practice in the exam room and at the bedside.

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MR. BUSKER: Welcome back to our April 2010 eInfections Review podcast. Our topic is Staph aureus infection. I'm Bob Busker, managing editor of eInfections Review. And our guest is Dr. Sara Cosgrove, Associate Professor of Medicine in the Division of Infectious Diseases at The Johns Hopkins University School of Medicine in Baltimore.

We've been bringing the data presented in our March 2010 newsletter into clinical practice via case scenarios. We want to focus now on how to better evaluate the risks and the benefits of decolonizing hospitalized patients with MSSA and MRSA. So if you would, Dr. Cosgrove, tell us about a typical patient.

DR. COSGROVE: Our next case is a 45 year old female with diabetes who is admitted to the medical intensive care unit for treatment of diabetic ketoacidosis. She undergoes MRSA surveillance cultures of the nares on admission. And although she has no history of skin infections or prior history of MRSA infection, her nares culture returns positive for MRSA.

MR. BUSKER: Let me start out with the most basic question: what should the clinician do with this information?

DR. COSGROVE: Well, obtaining MRSA surveillance cultures has increased dramatically over the past five years. In many states doing this is required, and across the entire VA system all patients are screened for MRSA colonization upon admission.

As a consequence, many clinicians are faced with the question of what to do clinically with this information. It is important to remember that the reason that this is being done is for infection control purposes. This process is known as active surveillance, and the idea is that if you learn that a patient is colonized with MRSA you place them in isolation precautions and, optimally, that decreases the risk of spreading the MRSA in that patient to the patient next door across the hall.

So outside of the control of the clinician, in most institutions a patient found to be colonized with MRSA will be placed on contact precautions to prevent this cross transmission. However, from a clinical standpoint, often we're not quite sure what to do with the knowledge that a patient is colonized

with MRSA. And there is a wide variation in practice across institutions as whether decolonization should be attempted.

MR. BUSKER: Let's talk about the potential benefits of decolonizing a patient.

DR. COSGROVE: It's important to recognize that a few studies have looked at the question of what happens to patients who are MRSA colonized while hospitalized, and the unfortunate truth is that these patients are at significant risk of going on to develop MRSA infection.

One study found that 29 percent of patients became infected with a mean onset of 102 days after their initial screening culture. So it kind of naturally follows to ask the question, well if we eradicate this colonization, can we prevent these infections?

In addition, there is also the possibility that if you decrease the burden of MRSA colonization in one patient, that may go above and beyond just isolation precautions in terms of preventing cross transmission to other patients.

And then, finally, there's some more intangible potential benefits of decolonization. You might get brave enough to actually take that patient off isolation precautions if, indeed, you are able to eradicate the MRSA, and that will likely make the patient happier and allow the health care workers to go into the room without having to don gowns and gloves. So that's also a potential benefit.

So the questions that really should be answered are: are there decolonization strategies that lead to negative surveillance cultures down the road? Are there decolonization strategies that have been shown to actually decrease infection down the road? And, also, what kind of agents have been used therapeutically for decolonization?

MR. BUSKER: Let's stay on that point for a moment. The agents that have been studied for decolonization, would you review those for us, please?

DR. COSGROVE: Sure, I think the one we most commonly think of is mupirocin nasal ointment. That drug is generally administered to both nares twice a day, usually for five days, both in clinical practice and in clinical trials.

The main limitation of mupirocin is kind of obvious: you are only putting it in the nose and so it only really addresses nasal colonization and not colonization of other body sites, and there is decent evidence that MRSA, particularly community acquired MRSA, but also health care associated MRSA, resides in other areas such as the axilla and the groin.

The other thing to know about mupirocin is that it's not a super drug, its greatest effect is generally in the first couple of months and then it basically wears off, with patients tending to become recolonized at the same rate as patients who were never treated with mupirocin in the first place.

The other agent that has been looked at generally in combination with mupirocin is chlorhexidine. Chlorhexidine is an antiseptic and is used as a body wash.

And then the third prong, which is not one that I particularly like, is the use of systemic antibiotics. The main reason I don't like this is that a handful of studies from the early 1990s looked at the use of systemic antibiotics to bring about decolonization in hospitalized patients. Not only were they not effective, but they also led to development of resistance to those antibiotics. A couple of them were I believe halted early because of that issue.

MR. BUSKER: Dr. Cosgrove, the evidence basis on the efficacy of these approaches, what can you tell us about that?

DR. COSGROVE: So with regard to the success in decolonization, there really are mixed results. In some populations, such as dialysis patients or patients about to undergo surgery, decolonization is likely pretty effective and has been shown to decrease infection. And we'll talk about the most recent paper that's been published looking at patients undergoing surgery in just a moment.

However, I think there needs to be a critical distinction made for patients who are not in those particular risk groups. For patients on general floors, and these are the floors where truthfully most of the MRSA colonization exists, data that decolonization actually works or helps prevent subsequent infection are pretty weak.

In a small study from 1999, in which patients were randomized to either receive mupirocin plus

chlorhexidine washes, or placebo, there was a trend to reduce nasal colonization, but infection rates did not change at all in the patients who either got mupirocin and chlorhexidine washes or placebo.

There has also been a more recent study that's looked at colonization and infection rates in a cohort of patients who did and did not receive mupirocin, and this study also failed to show any benefit in reducing MRSA infections down the line.

There is also a third study that looked at a giant combination of all things to reduce colonization of MRSA. They used mupirocin, chlorhexidine washes, and the antibiotics doxycycline and rifampin. In this study there was more decolonization at the end of a 3-month period in patients who received that cocktail, and 74 percent of decolonized patients remained MRSA free, whereas only 32 percent of controls remain MRSA free.

But what they noted in this study was that mupirocin resistance developed in a few patients, which is concerning, and that 18 percent of patients had new acquisition of MRSA. I think this finding really gets at the heart of the problem with trying to decolonize patients, you know, in general, in large groups. It's probably very likely to decolonize patients who are going to be discharged from the hospital and go out into the same environment where they potentially got MRSA in the first place. So, particularly patients in who are in a nursing home or a long-term care environment, they are just going to be rechallenged with MRSA again, and a large number of them are likely to be recolonized again.

We currently don't have consensus guidelines that tell us to try this kind of routine decolonization and I think it's pretty clear why we don't have these. We don't have good evidence that it really impacts patient outcome.

MR. BUSKER: We've talked about the benefits; is the primary potential risk of decolonization the development of resistance?

DR. COSGROVE: I really think it is, both from a patient standpoint and a societal standpoint. We talked about mupirocin resistance that was seen in the study that I just mentioned, but it is also interesting to note that in other countries where mupirocin was made available over the counter, that significant increases in mupirocin resistance were

found that then abated after mupirocin was made a non-over the counter medication again.

You know, again, I describe mupirocin as not being a super drug, and it really is not a super drug. I think it really needs to be used wisely and in patient populations where it really makes a difference, and not just in everyone who shows up at your doorstep.

Chlorhexidine can occasionally cause rash or skin irritation, although generally it is pretty well tolerated. There are some increasing concerns about chlorhexidine resistance, and a paper was published where this kind of resistance was detected in an institution where they had been routinely using chlorhexidine body washes. In addition, it is possible that chlorhexidine use may select for more resistant gram negative organisms, but we need to see some additional data looking at that.

MR. BUSKER: Dr. Cosgrove, I'd like us now to get into the special case of a patient undergoing surgery. So let me revise the patient scenario. As you first described, the patient's nares cultures return positive for MRSA. And let's say you decide not to proceed with decolonization. Okay, so a few days into hospitalization the patient develops chest pain and EKG changes.

You do a cardiac cath, and it reveals that there's multi-vessel disease. So now the patient is scheduled for cardiac surgery. Let's talk about the need for decolonization in this situation.

DR. COSGROVE: Well this is a different situation than the one that I've just described, and I think there is increasing evidence that decolonization in a patient with MSSA or MRSA prior to a major surgical procedure is very worth our consideration.

This has been an issue that has been under debate for a long time, and studies going back a decade have looked at this question, in both patients undergoing orthopedic surgery and general surgery. Although in the study that looked at this practice in general surgery there was not a decrease in *S. aureus* surgical site infections, there was a decrease in nosocomial *S. aureus* infections when they did a subgroup analysis.

So, you know, the use of mupirocin by itself was already likely having a benefit in the pre-op setting, but there is still some debate about it because that

was a subgroup analysis and people want to see a real good, randomized, controlled trial that really proves its benefit in decreasing surgical site infection.

And one of the thoughts about why surgical site infection didn't decrease with mupirocin alone is one that we've talked about, Mupirocin acts at the level of the nose and *S. aureus* may be found in other parts of the body besides the nose.

There was a recent paper out of the Netherlands in which patients undergoing surgery underwent rapid testing with PCR of nasal swab to look for the presence of *S. aureus*. And patients were then randomized to receive five days of mupirocin plus daily chlorhexidine body washes, versus placebo. The patients were followed for six weeks after they received these medications.

The results of the study showed a significant reduction in *S. aureus* infection postoperatively in patients who received the mupirocin and chlorhexidine combination therapy. And the vast majority of these infections were surgical site infections.

Only 3.4 percent of patients in the treatment group developed *S. aureus* infection postoperatively, whereas 7.7 percent developed post-op infection with *S. aureus* in the placebo group. And this was 60 percent risk reduction.

So at this point I think the evidence is pretty strong that if you have a patient who is colonized with either MSSA or MRSA, that you should strongly consider decolonization prior to surgery.

It is important to note, because that study was done in the Netherlands, where they don't have any MRSA, that none of the patients had MRSA. So we are doing a little bit of extrapolation when we recommend this for patients with MRSA colonization. But I think it's a reasonable extrapolation.

MR. BUSKER: Dr. Cosgrove, what about other considerations for this patient's surgical procedure?

DR. COSGROVE: Well that's a good question. I think the other issue is what should this patient's antibiotic surgical prophylaxis be. In a patient who is known to be colonized with MRSA and is about to have cardiac surgery, I think some people would certainly consider using vancomycin for surgical prophylaxis. On the surface of things that

seems like a good idea. I think it is important, however, to caution that vancomycin is not always the best drug for surgical prophylaxis because it has to be infused over a least an hour to avoid red man syndrome, and many of our surgical patients need more than one gram of vancomycin. If you need more than a gram of vancomycin you need to be infusing it over an even longer period than an hour.

So the use of vancomycin certainly requires some pre-planning in the OR. A lot of institutions have already dealt with these issues, but it probably doesn't help a lot to start the vancomycin at the time of the incision. There has to be preplanning to make sure that the bulk of the vancomycin gets into the patient before incision time.

The other concern about vancomycin is whether it gets adequate tissue concentrations in the area that you want tissue concentrations, which is the skin and soft tissue, and in the case of cardiac surgery, the sternal bone.

And the truth is, vancomycin probably doesn't get as good tissue levels in those areas as a beta-lactam agent such as cefazolin, which is a commonly used as surgical prophylaxis for these kinds of procedures.

One solution to this whole issue is to give both vancomycin and cefazolin to patients, and some institutions actually do this. Other institutions use vancomycin plus cefotetan or cefoxitin for a little additional gram negative coverage, because patients are having dissection of the groin area for the same graft harvest.

So there is no right answer to this question, but I think a lot of consideration has to be given to giving vanco, but making sure that you know how you are going to coordinate that in your operating room, or to giving vanco plus another cephalosporin for surgical prophylaxis.

MR. BUSKER: Thank you, Dr. Cosgrove. Let's switch gears now and address the role of decolonization in the management of recurrent MRSA in the outpatient setting. Would you give us a typical case scenario, please?

DR. COSGROVE: Sure. Let's think about a 25 year old female who is seen in clinic for recurrent skin infection. She has a recent history of a boil on her chest associated with fever necessitating antibiotic treatment along with drainage at a local urgent care center. She has been seen three times in the last year for the same problem. Culture

of the purulent fluid that was drained from one of those areas grew MRSA and she also has a nares culture performed which grows MRSA.

MR. BUSKER: So in this outpatient, what are the recommendations for decolonization?

DR. COSGROVE: I think it's important in the setting of community acquired MRSA, and recurrent community acquired MRSA disease, to look at the whole picture of the patient before rushing straight to decolonization.

So we kind of know from clinical experience that there are a lot of issues that you want to address with a patient before you think about aggressive decolonization approaches. First and foremost is reviewing with the patient some personal hygiene approaches for preventing recurrent infection. And these include practicing frequent hand hygiene, especially after doing dressings of the contaminated site, but just in general doing frequent hand hygiene.

All the draining wounds should be covered with clean, dry bandages. It is important to recommend that patients with these problems not share personal items, so they should use their own towel, their towel should be laundered routinely, and their clothing should be laundered routinely.

They should be advised to avoid shaving and certainly not to share razors. They should be advised to at least on a regular basis launder clothing, sheets and towels in the hottest suitable temperature. For people who are having an issue associated with a sports team, to clean all personal sporting equipment and clothing. This is often easier said than done, if you look at some of the complicated football and lacrosse equipment that's out there, but it is really critically important.

You know, I have talked about how I think mupirocin is a bit wimpy, and I think there is really no way that mupirocin is going to be able to overcome inadequate personal hygiene, so that is why I bring this up as a really important point in counseling a patient.

Some other questions that are important in this setting are is there any evidence of family members with the same problem, because they need to receive the same counseling and management. And then also, before I think of doing decolonization at the individual patient level, I do make some recommendations about decontamination of the patient's environment.

Although I cannot give you any good literature to support this practice, it just seems to make good common sense. It's something we do in the hospital setting and something I think that can be done at home, and that is making sure that high touch surfaces, particularly those in the bathroom, are wiped down daily with some kind of disinfectant. Most disinfectants that you can buy at the grocery store have activity against MRSA, so it doesn't have to be full on bleach or anything like that; I think it can just be something you purchase at the store.

So if a patient has done all of those things and is still having recurrent infection, and you are pretty confident that the patient has done all of those things, then comes the time to possibly think about whether decolonization is effective. And I say this thinking that if you have family members that are also having the same problem, you also need to bring those family members in and talk to them about these issues.

MR. BUSKER: And your treatment recommendations?

DR. COSGROVE: In general, if a patient has a positive nares culture growing MRSA, as our patient in this example does, I will treat with mupirocin. We are lucky in this case because we know this patient is MRSA positive in the nose. I think there is some controversy with regard to whether you should do a nasal swab before treating with mupirocin if you don't know their nasal colonization status.

I favor doing that because I don't really want to give someone mupirocin if they are not colonized with MRSA in their nose for fear that I might eradicate some other useful organism that's in the nose.

I think the other thing we have recommended is chlorhexidine or hexachlorophene body washes. That can be kind of expensive, so an alternative is a dilute bleach bath, although we have no idea from the literature what the appropriate frequency of these kind of washes or baths are. I usually recommend every other day for the first couple of weeks, and then weekly after that, but there really is no data to tell us one way or another.

MR. BUSKER: What about the role of antibiotics in decolonization for recurrent community acquired MRSA?

DR. COSGROVE: I do not recommend the use of antibiotics solely for the purpose of decolonization. I don't think that that generally works very well and really leads to unnecessary antibiotic exposure.

If you need to treat an infection, then it is reasonable to give antibiotics. There is some controversy as to whether those antibiotics should include rifampin. Rifampin is the one agent that has been looked at in the literature over time that seems to be more effective in reducing colonization than other anti-staphylococcal drugs, but it is not a drug that does not have its own issues and side effects.

Specifically, if you use rifampin by itself you will develop very rapid resistance to rifampin, so it must always be used in combination with another antibiotics. And second, rifampin has some significant drug interactions, so it should never be started without a careful review of other drugs that a patient is taking to see if there is potential interaction.

And finally, it does have the potential for liver toxicity and that has particularly been seen in patients with underlying liver disease, such as hepatitis C.

So some people will do a combination of rifampin plus another agent, often doxycycline, or Bactrim, or clindamycin, for the purpose of both treating the patient for a new MRSA infection, but also with the hopes that that combination therapy may also lead to some decolonization. It's important to just note, however, that we don't have any good data that tells us if that actually works.

MR. BUSKER: Dr Sara Cosgrove from The Johns Hopkins University School of Medicine. Thank you, for participating in the eInfections Review Podcast.

DR. COSGROVE: Thank you, I had a good time today.

MR. BUSKER: This podcast is presented in conjunction with the eInfections Review Newsletter, a peer-reviewed, CME-accredited literature review e-mailed monthly to clinicians treating patients with infectious diseases.

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