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➔ INSIDE

Infection Preventionists and 'Psychological Safety':

The majority of infection preventionists surveyed reported the lack of a strong "psychological safety" culture in their hospitals, meaning workers may be less likely to point out breaks in aseptic technique 16

C. diff: Colonization and Consequences:

One in 10 patients bring in *C. diff* through the front door 18

Drug-Resistant Infections in Pediatrics:

Children generally are faring better than adults. 19

Infectious Disease Update:

Are you looking for ESBLs? 21

Respiratory Protection:

With this young century already seeing pandemic flu and outbreaks for severe acute respiratory syndrome, Middle East respiratory syndrome, and Ebola, respiratory protection remains a critical and controversial issue. 22



Parents Can Pose Staph Risk to Babies in NICUs

Clinical trial shows transmission link, raises difficult questions

By Gary Evans, Medical Writer

The parents of babies in neonatal intensive care units (NICUs) can serve as a gateway for *Staphylococcus aureus* to colonize and potentially infect their newborns, researchers report in a recently published clinical trial.¹

Although there are considerable caveats and questions about the implications, the research also showed that treating colonized parents with mupirocin and chlorhexidine can reduce the risk of transmission to the baby by half.

"Parents may be an important reservoir that we really need to think about," says lead author **Aaron Milstone**, MD, MHS, associate epidemiologist and professor of pediatrics at Johns Hopkins Hospital in Baltimore.

Approximately 25-30% of people frequently carry *S. aureus* asymptomatically as part of their normal microbiome, often in the nose. Thus,

some parents may expose their newborns to staph by visiting them in NICUs, where they often are placed if born prematurely or have complications. It is well known that colonization with drug-susceptible staph or methicillin-resistant *S. aureus* (MRSA) can be a prelude to clinical infection in neonates.

While the study confirms the possibility of parent-to-child transmission, Milstone stresses that the results should not be used to undermine the critical bond between newborns and parents.

"What we in no way want to do is to discourage parents from coming [to the NICU] or being in touch with their kids," says Milstone. "We want to raise awareness — to say as healthcare workers, 'What can we do to mitigate risk? Is there a way we can safely have [colonized] parents participate in their child's care and be with them as much as possible?'"

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Treatment and Placebo

The researchers tested parents, who had given informed consent, for nasal carriage of MRSA and drug-susceptible staph. The culture-positive parents were randomized into two arms of the study. In one, parents were treated with intranasal mupirocin and topical chlorhexidine for five days. In the placebo arm, parents were treated with petrolatum intranasal ointment and nonmedicated soap cloths for the same time period.

The double-blinded, randomized clinical trial was conducted in two Johns Hopkins NICUs. Overall, *S. aureus*-colonized parents of 236 neonates were enrolled in the study from Nov. 7, 2014, through Dec. 13, 2018.

“The intervention was for the parents,” Milstone says. “We screened the parents and identified the parents that had *Staph aureus*. The outcome was measured in the neonates — which of them acquired the same staph strain as their parent had?”

The primary endpoint was concordant *S. aureus* colonization by 90 days, defined as neonatal acquisition of the same strain as the parents at the time of screening.

“Among 190 neonates included in the analysis, 74 (38.9%) acquired *S. aureus* colonization by 90 days, of which 42 (56.8%) had a strain concordant with a parental baseline strain,” Milstone and colleagues reported.

In the intervention group, 13 of 89 neonates (14.6%) acquired the same staph strain as their parents. In the placebo group, 29 of 101 neonates (28.7%) were colonized with the parental strain. The intervention “reduced the likelihood of a child acquiring the same strain as the parent by more than 50%,” he

says. “In our primary analysis, there were six kids who acquired MRSA [colonization]. Four of the six got the same strain that their parent had. [In other words], two-thirds of the babies who acquired MRSA in this study in the NICU got the same strain that the parent had. For me that is a very important observation, because it does challenge our current thinking about MRSA prevention in NICUs.”

The standard practice in the two NICUs is active surveillance and decolonization if staph is identified, so the focus was less on actual clinical infections. However, preventing colonization and decolonizing infants is known to stave off subsequent infection, he says.

“Because of that [practice], we have a very low rate of infection in our NICUs,” Millstone says. “In NICUs that are not identifying staph and decolonizing, the infection rates may be higher, so [the intervention] may have more impact on reducing infections.”

Ethical Questions

The study was approved by an institutional review board that provided ethical oversight. Still, there are questions raised about studies that divide groups into one that receives an intervention and another that is given a placebo. That was not an issue for this intervention for a very simple reason, Milstone notes.

“The reason it wasn't [an issue] was that we had no idea if this was going to do anything,” he says. “No one has done this before. The current standard of care is to do nothing. Nobody gives anything to parents, so I think what we were really doing was testing a treatment. There wasn't concern, because we were not taking anything away. The standard of care was to do nothing.”

In that sense, the placebo essentially mimicked the standard of care, while the use of mupirocin and chlorhexidine tested a treatment. The original concept was to just do the intervention arm without a placebo, but the researchers thought that might change parents' behavior if they were told they were colonized with staph but offered nothing.

"If parents saw that we were treating someone and we are not treating them, it might change their behavior," Milstone explains. "By using the placebo, we were able to eliminate the likelihood that someone would feel like they were causing risk to their child. We told the parents that you have bacteria that you could give to your child. So just that itself may change people's behavior, but that [disclosure] was consistent across both [arms of] the study."

The parents who agreed to participate were told they had *S. aureus*, but not whether it was MRSA or drug-susceptible. Otherwise, the parents followed standard protocol in the NICUs. They were advised to wash their hands before interacting with their child, but infection control did not extend to the level of wearing gloves or gowns. Regarding hand hygiene in general, Milstone said parents typically are compliant at the onset but may not repeat handwashing after various actions throughout a visit.

The trial is the first to definitively link parent staph colonization to colonization of their babies in the NICU, raising the question of how many NICU staph infections could ultimately be traced to the patients' parents.

"We don't know," Milstone said. "We have always speculated that parents were a reservoir. In the hospital, for example, we are very careful about tracking MRSA. Often,

you would have twins or triplets who were separated in the different areas of the NICU and they would all get the same strain of MRSA. How did that happen? We always speculated that maybe a parent [or a healthcare worker] was the reservoir."

Prior to this study, there was little data on this issue beyond anecdotal information and case reports. A clinical trial provides significant evidence, but there are open questions about the difficulty in enacting such practices routinely across NICUs.

"Obviously, the greatest concern we have is fostering family-centered care at the same time that we protect the child from infection," Milstone says. "It is very similar to trying to think about sibling visitations, pet therapy — all of these things we do to make kids in the hospitals have a better stay."

On the other hand, there are obvious challenges in asking parents of children in NICUs to comply with testing and treatment protocols. In addition, more broad use of mupirocin and chlorhexidine raise concerns about triggering resistant organisms.

Parent 'Guilt'

An editorial accompanying the study raised that issue and other questions, including, "If an infant did become colonized or infected, could parents feel responsible or guilty?"²

Parents of a preterm baby are already stressed and face uncertain outcomes and concerns about developmental delays and long-term problems, says coauthor of the commentary **Lisa Saiman**, MD, a professor of pediatric infectious diseases at Columbia University in New York City. The unintended consequences would have to be weighed if the intervention is

deemed clinically significant in further research to merit wider implementation, she explains.

"First, [parents] are being asked to understand the difference between colonization and infection, which may be a difficult thing for some people," Saiman says. "You are doing the therapy [intervention] as best as you can, but if the baby gets an infection — what does that feel like to that parent? How would you really be able to explain that to them in a meaningful way?"

Typically, NICUs ask parents to practice hand hygiene and basic infection control, including avoiding visits if sick.

"This is really different — this is a completely different paradigm," she says. "I think it is a very important proof-of-concept study. It shows something that no one has ever shown before, but it is certainly not ready for widespread implementation yet."

It is important, for example, to avoid stigmatizing parents by emphasizing that a lot of people are colonized with staph as part of their normal flora and microbiota, she says.

"We encourage parents to bond with their babies, and one of the ways we do that is through frequent touching and skin contact," Saiman adds. "But none of the current interventions that we have to fight staph infections are perfect."

That said, to implement parental testing and treatment more broadly would require a much larger study over multiple sites that showed prevention of staph infections — not just colonization, she says.

"This is not such an easy intervention for families to do," she says. "It took a long time to recruit for this study. As you can imagine, parents are under so much stress when they have a baby in the NICU.

Their activities of daily living are totally disrupted. They are back and forth to the hospital all the time and they are probably not sleeping well.”

In addition, as Milstone acknowledged, both study units had active surveillance and decolonization protocols in place, limiting generalizability to other settings, she says.

“Scalability is another important factor,” the commentary noted. “Despite a presumably experienced

research recruitment team, accrual of participants in this study appeared to be slow. The study took four years to complete. ... This rate of accrual may reflect the complexity of the study question, strict inclusion criteria that limited participation, or parental concerns about randomization.” ■

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Is It Safe to Speak Up? Infection Prevention and ‘Psychological Safety’

Work culture boils down to ‘the worst behavior leaders knowingly tolerate’

The majority of infection preventionists (IPs) surveyed in a new study¹ reported the lack of a strong “psychological safety” culture in their hospitals, meaning workers may be less likely to point out breaks in aseptic technique and other incidents that could undermine patient safety.

In contrast, the 38% of responding hospitals reporting a strong climate of psychological safety had infection control practices that reflected this work culture. For example, IPs in these hospitals regularly use urinary catheter reminders, stop-orders, and nurse-initiated catheter discontinuation to prevent urinary tract infections. Similarly, IPs in cultures of psychological safety frequently used “sedation vacation” approaches to prevent ventilator-associated pneumonia.

Another classic example from the medical literature is the dramatic reduction in central-line bloodstream infections after nurses and other team members were given the power to “stop the line” if they saw a break in technique during insertion.²

“Our finding that the large majority of responding hospitals did not report high psychological safety is concerning, but not unexpected,” the authors of the current study conclude. “Much of the literature on psychological safety provides little insight into how psychological safety unfolds and builds, or lessens, or even is destroyed. What is known is that an environment that supports psychological safety does not emerge naturally.”

That begs the question of how IPs can strengthen this sense of safety and empowerment.

“The best way to start building a culture of psychological safety is to ask people if they feel safe to speak up if they see an issue, mistake, or have an idea for improvement,” says lead author **Todd Greene**, PhD, MPH, an epidemiologist and research scientist at the University of Michigan.

“Another approach is to include in rounds the question, ‘Is everything as safe as you wanted it to be?’ Then follow up with, ‘What do you need?’”

Of course, needed changes may not be addressed without

the involvement and support of administration.

“The culture of any healthcare organization is heavily shaped by the worst behavior that the leaders knowingly tolerate,” Greene says. “As leaders within their organizations, IPs help shape that culture.”

A ‘Shared Belief’

Greene and colleagues surveyed IPs in a random sample of some 900 U.S. acute care hospitals in 2017. They sought input on hospital and infection control program characteristics, organizational factors, and the use of practices to prevent common healthcare-associated infections (HAIs).

On a five-point scale, IPs that gave their hospital a 4 or 5 ranking on seven key questions were classified as having a work culture with high psychological safety.

“Psychological safety is a shared belief that team members will not be reprimanded, punished, or embarrassed for speaking up, sharing ideas, posing questions, raising

concerns, or making mistakes,” the researchers report.

The overall survey response rate was 59% (528 of 897).

“Although nearly 80% of hospitals were involved in collaborative efforts to reduce HAIs, only 53% of hospitals reported receiving strong to very strong support for infection control programs from hospital leadership,” the authors found. “Over 41% of hospitals reported they had a hospital epidemiologist, and 62% had a lead infection preventionist certified in infection control. Less than half (47%) of hospitals had a program engaging patients and families in infection prevention.”

The overall results for the psychological safety questions were as follows:

- Do you assert your views on important issues, even though your supervisor may disagree? (88%)
- I personally feel comfortable speaking up when I see a physician not clean his or her hands. (81%)
- When a medical error occurs at this hospital, healthcare workers are encouraged to discuss mistakes in order to learn how to prevent similar future errors. (91%)
- If you make a mistake at this hospital, it is often held against you. (5%)
- Staff members at this hospital are able to bring up problems and tough issues. (77%)
- It is safe to try something new at this hospital. (66%)
- At this hospital, people are too busy to invest time in improvement. (15%)

“It is not surprising that high levels of psychological safety are associated with frequent use of socioadaptive safety interventions, such as nurse-initiated urinary catheter discontinuation or ventilator sedation vacation,” the authors

conclude. “These practices require communication between nurses, respiratory therapists, and physicians, efforts by bedside staff to engage with patient and family requests, and the willingness to speak up and challenge entrenched customs and practices.”

Speaking a Truth

Lakshman Swamy, MD, MPH, a critical care clinician at Boston Medical Center, has been involved in efforts to improve psychological safety at the facility. He was not involved in the study but has witnessed firsthand how the fear of repercussions impair infection control efforts.

Part of improving a culture of safety is for those in power to show “situational humility,” Swamy noted recently in Orlando at the Institute for Healthcare Improvement’s 2019 forum, held Dec. 8-11. Swamy recalled a surgeon at a meeting with members of nursing and other disciplines who asked for input on a case, saying — quite unexpectedly — that he was not sure he made the right decision.

“That one statement changed everything. Suddenly, you had the interns, the nurses, everyone in the room was asking questions,” he said. “If [the surgeon] could say that, then the rest of us could ask the questions that otherwise we might not have the psychological safety to ask.”

In a follow-up email exchange, *Hospital Infection Control & Prevention* asked Swamy for further comment on psychological safety.

“In almost all cases, front-line clinicians care deeply about the patient’s well-being and put the care of the patient first,” he replied. “But the truth is that the environments we work in can actively work against that very ideal. We’re recognizing that more and more clinical environments

— especially learning environments — are toxic in one respect or another.”

This toxicity can be manifested in “aggressive hierarchies” that exhaust clinicians and contribute to burnout, Swamy says. “This certainly is a major barrier to psychological safety and it relates directly to infection prevention and is evident in my work in the intensive care unit,” he says.

Swamy relayed the following vignettes from other institutions where he previously worked, with details slightly altered to preserve anonymity:

- Dr. S. is the resident on an intensive care unit. She knows Rob, the nurse taking care of Mr. C., has been rough with her and other residents in the past, openly ridiculing residents on rounds in front of the team. He also has made a number of comments to the families about waiting to speak to the doctor, referring to her attending and bypassing her entirely. Dr. S.’s patient, Mr. C., has had a central line in place for several days, and from her perspective, it is time to take it out. She knows Rob is going to get upset by this — he wants the line for blood draws. Dr. S. knows bringing it up will lead to an argument — she probably will be mocked and belittled on rounds again. The checkbox “remove CVC” has been on her to-do list for two days now.
- Amy is a floor nurse on a med-surg unit. Her patient is on *C. diff* precautions because of persistent diarrhea. The attending is notoriously grumpy and chews out nurses for things entirely out of their control. She notices, day after day, that the doctor is not properly washing his hands with soap and water after he leaves the patient’s room. She is not sure if he is unaware that the alcohol-based hand sanitizer is inadequate

for *C. diff*, or if he just does not care. Amy does not know how to approach him about this, and she is feeling torn between her desire to do what is right and the risk of being attacked for speaking up.

“Both of the cases reflect a lack of psychological safety,” he says. “It isn’t about being coddled, and it isn’t

utopian. Far from it; it is extremely practical, even gritty. It is all about hearing what you may not want to hear, and the ability of others to speak that truth.” ■

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C. diff: Colonization and Consequences

One in 10 patients bring in C. diff through the front door

Although once thought of almost exclusively as a hospital-acquired condition, *Clostridioides difficile* has established a presence in the community that means about 10% of incoming patients could be carrying it asymptotically, a new study finds.¹

Researchers tested 220 patients who showed no symptoms of *C. diff* infection when they were admitted between July 2017 and March 2018. Perirectal swabs were completed within 24 hours of admission, and the patients were followed for six months. Upon admission, 21 patients were identified as carriers.

Within approximately six months, 38% percent of the asymptomatic carriers had developed full-blown *C. diff* infection — compared to just 2% of the noncarriers.

The study raises difficult questions, not the least of which is, if you seek information are you compelled to act on it? Clearly these colonized patients are at some risk themselves and may serve as a reservoir for transmission to other patients. On the other hand, there is no clear path to decolonization, and putting more patients in contact isolation has adverse effects of its own.

The lead author of the study, **Sarah Baron**, MD, MS, director of inpatient quality improvement

at Montefiore Health System in New York City, spoke about the implications in an interview with *Hospital Infection Control & Prevention*.

HIC: You show that asymptomatic *C. diff* carriers can go on to develop active disease after admission. If screening is done and this colonization state is known, what are some of the options and implications for infection prevention?

Baron: I think for now we have a few ways to think about this. First of all, if screening was performed and we knew the colonization state of all patients, we could more carefully protect those patients who were not carriers. We could intensify our cleaning efforts to reduce spread, modify our isolation protocols, and educate the families. Infection prevention would carry some of the heaviest burden.

For the population who are carriers, though — the patients who went on to have symptomatic *C. difficile* almost 40% of the time in our study — we really could tailor our treatment with even more antimicrobial stewardship and potentially prophylactic treatment for high-risk patients.

In general, the knowledge that we would gain by identifying carriers

might be an amazing opportunity to protect all of our patients, not only the carriers, from symptomatic infection.

HIC: You note that the infection preventionists would bear a fair portion of the burden. What are the pros and cons of putting these patients in contact isolation?

Baron: There are huge downsides to putting more patients in contact isolation, many of which I experience myself as a hospitalist caring for patients. The time and effort that it takes to appropriately put on personal protective equipment means that, amongst other things, patients get fewer visits or care from their care teams.

We have seen this in multiple studies, and it truly can lead to suboptimal patient care, even as we all are trying to keep everyone safe. The question that many institutions are grappling with is how to minimize those downsides while maximizing the protection that isolation provides.

HIC: Are there decolonization options for *C. diff* carriers?

Baron: As of now, I do not know of any decolonization options, although we may be able to prevent full symptomatic *C. difficile* infection, in some high-risk populations at least, with prophylactic antibiotics.

HIC: Are you concerned that identifying colonized patients could encourage treatment or antibiotic use that may exacerbate their condition and lead to full-blown *C. diff*?

Baron: Absolutely. This was one of the concerns even performing our study, which is why we did not notify providers that their patients were carriers — unless and until the providers requested *C. diff* testing. Alongside the ongoing research on *C. diff* prophylaxis, treatment, and prevention, we will need some pragmatic research on educating clinicians to not reflexively treat and isolate *C. diff* carriers as if they had symptomatic disease. As a physician working in the hospital, I know that this message will take time to permeate. I, myself, would have had a difficult time not treating a positive *C. diff* test result before I started working in this area.

HIC: On the other hand, you note that knowing this colonized state enables clinicians to avoid using antibiotics known to disrupt the microbiome and set up *C. diff* infection.

Baron: Yes. One of the hallmarks of successful antimicrobial stewardship programs is the decrease in use of antibiotics, which have been associated most strongly with the development of *C. diff*. This work continues, of course, but has become more and more nuanced with time.

Unfortunately, avoiding antibiotics is very difficult, as some of the antibiotics that we use to treat *C. diff* infections have been implicated in leading to more *C. difficile* infections — a tricky paradox. While all of us rely heavily on our colleagues in antimicrobial stewardship, I know that there also is work looking at innovative solutions to these

issues, from more selective anti-*C. diff* antibiotics to oral beta-lactamases, which effectively might degrade any of our intravenous antibiotics that make it into the gastrointestinal tract and protect the microbiome. Screening for *C. difficile* carriage is one potentially useful step in our efforts towards *C. difficile* prevention, although certainly not the only option available. ■

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Antibiotic-Resistant Infections in Pediatrics

Children generally are faring better than adults

There are some signs of progress in drug-resistant infections in pediatrics, suggesting that antibiotic stewardship efforts may be having an effect and fewer broad-spectrum agents are being used on this important patient group, the Centers for Disease Control and Prevention (CDC) reports.¹

CDC investigators looked at common pathogens and antimicrobial resistance patterns for healthcare-associated infections (HAIs) among pediatric patients that occurred in 2015-2017. These were data reported to the CDC's National Healthcare Safety Network (NHSN).

Antimicrobial resistance data were analyzed for pathogens implicated in central line-associated bloodstream infections (CLABSIs), catheter-

associated urinary tract infections (CAUTIs), ventilator-associated pneumonias (VAPs), and surgical site infections (SSIs). This analysis was restricted to device-associated HAIs reported from pediatric patient care locations and SSIs among patients younger than 18 years old.

Overall, 2,545 facilities performed surveillance of pediatric healthcare-associated infections (HAIs) in the NHSN during this period. *Staphylococcus aureus* (15%), *Escherichia coli* (12%), and coagulase-negative staphylococci (12%) were the three most commonly reported pathogens associated with pediatric HAIs. Among CLABSIs, the percentage of resistance was generally lowest in neonatal intensive care units and highest in pediatric

oncology units. *Staphylococcus* spp. were common particularly among orthopedic, neurosurgical, and cardiac SSIs; however, *E. coli* was more common in abdominal SSIs. Overall, antimicrobial resistance was less prevalent in pediatric HAIs than in adult HAIs.

Q & A

Hospital Infection Control & Prevention sought additional details on the study and the CDC responded via email. The following answers were attributed to CDC personnel **Sarah Kabbani**, MD, medical officer, Office of Antibiotic Stewardship, and **Cliff McDonald**, MD, associate director for Science in the Division of Healthcare Quality.

HIC: What are your thoughts on why there is less antibiotic resistance in pediatrics? This seems counterintuitive to the large number of antibiotics prescribed in outpatient pediatric care.

CDC: We attribute the differences in resistance between adult and pediatric infections to differences in the overall characteristics of these patient populations. The pediatric patient population, as a whole, tends to have accumulated fewer exposures to antibiotics and healthcare facilities compared to adult patients, who are more likely to have had numerous interactions with healthcare facilities and antibiotics over many years.

In the outpatient setting, antibiotic prescribing rates in children have been decreasing from 2011 to 2016, whereas prescribing rates in adults have increased. The antibiotic prescribing rate in older adults over age 65 is higher than any other age group.² Another factor is that adults are more likely to receive broad-spectrum antibiotics than children, for example, for respiratory tract infections.³

Some pediatric patients, such as those in pediatric oncology units, may have complex medical needs, frequent antibiotic exposures, and recurrent use of indwelling medical devices. Infections in these patients may be more likely to be associated with an antibiotic-resistant pathogen compared to other pediatric patients. However, the cumulative proportions of resistant pathogens, overall, tend to be lower in the pediatric population compared to adults.

HIC: Are pediatric settings doing some specific things with antibiotic stewardship that are proving effective in keeping drug-resistant pathogens in check?

CDC: There are multiple factors that could lead to lower drug-resistant

pathogens in pediatrics. As mentioned earlier, there are differences in the overall characteristics of adult and pediatric populations. However, the American Academy of Pediatrics and the Pediatric Infectious Diseases Society have consistently incorporated antibiotic stewardship principles into their guidelines, by recommending treatment strategies, such as “watchful waiting,” before deciding whether antibiotics are needed for certain infections and recommending narrow-spectrum antibiotics as first-line therapies when antibiotics are needed. The CDC has led educational efforts to improve antibiotic use among children since 1995 and the initial efforts were aimed at parents and pediatricians. Vaccines in children also have reduced antibiotic resistance and the need for antibiotics. For example, pneumococcal conjugate vaccine has led to decreases in pneumococcal infections, including serious infections like pneumococcal pneumonia and bacteremia, and common infections such as acute otitis media, which drive antibiotic use. Both overall and antibiotic-resistant pneumococcal infections decreased simultaneously. The CDC tracks the implementation of the Core Elements of Antibiotic Stewardship in U.S. hospitals, and a larger proportion of children’s hospitals met all seven core elements compared to other hospitals.

HIC: In the CDC’s recent antibiotic resistant threats report,⁴ was there one or two that are of particular concern in pediatrics?

CDC: We did not do any stratified analyses of the HAI antibiotic-resistant threats data by age. Thus, we cannot base a response on that basis. In terms of just the HAI antibiotic-resistance, the overall increasing threat of extended-spectrum beta-lactamase (ESBL) appears to extend

to pediatrics, at least from the NHSN reports. Assuming this holds true in the community (i.e., similar increasing rates) it would be safe to say this threat is of particular concern in pediatrics (as it is adults).

HIC: Can you characterize how much *Clostridioides difficile* you are seeing in pediatric patients and any particular antibiotics that may be predisposing them to that infection?

CDC: While there were increases in *C. diff* infections (CDIs) among children, as there were among adults, in the mid/late 2000s, it is safe to say that these have at least plateaued, if not decreased.

In addition, overall [CDI] rates are much lower in children and adolescents than adults.

Outpatient antibiotic prescribing has declined (i.e., more effective outpatient antibiotic stewardship) more in children/adolescents than adults. Whether the latter is leading to more declines in CDI among children/adolescents than adults, we do not know quite yet. However, there is good reason to think these changes in outpatient antibiotic prescribing could have an effect in overall pediatric CDI, as an even greater proportion of CDI in children/adolescents is community-associated (i.e., no recent inpatient care) than in adults. In terms of antibiotics that are associated most with CDI in pediatrics, a recent paper suggests that in the outpatient setting, the cephalosporins stand out.⁵ ■

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Infectious Disease Update: Are You Looking for ESBLs?

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Prevention strategies are necessary to limit transmission of multidrug-resistant organisms (MDRO) in the hospital, especially in high-risk settings. Identification of carriers of extended-spectrum beta-lactamase (ESBL)-producing organisms via active surveillance, and contact isolation of positives, has been recommended for certain high-risk groups (e.g., those in the intensive care unit [ICU]).

To thwart transmission of MDRO/extensively drug-resistant organisms (XDRO), our facility implemented routine ESBL surveillance in high-risk individuals in 2015, using perirectal swab specimens and the chromogenic agar culture technique. High-risk groups were considered to be admissions from long-term care facilities or an outside facility and patients on hemodialysis.

From 2015 to 2017, the prevalence of ESBL carriage steadily increased, up to 14% in patients admitted from skilled nursing facilities (SNF). This meant that many otherwise asymptomatic older SNF patients, who were simply ESBL carriers, now required contact isolation. However, in those who were critically ill or septic, identification

of ESBL carriage provided the advantage of preemptively employing the use of a carbapenem as clinically appropriate. One other important advantage to the active surveillance program was that during the three years of surveillance, only one patient was found to have “hospital-onset” ESBL not previously identified on admission. Thus, the program successfully kept the “transmission rates” of this MDRO remarkably low.

Ironically, as the prevalence of ESBL colonization in our screening population increased, so did the cost of the program. By 2017, the estimated the annual cost of ESBL surveillance was approximately \$250,000 (based on laboratory costs and not the cost of isolation supplies). This was in addition to active surveillance of methicillin-resistant *Staphylococcus aureus* (MRSA; required by California regulation), *Clostridioides difficile*, and carbapenem-resistant Enterobacteriaceae (CRE) (recommended by the CDC) in select patients and travelers. The burden to the micro lab was just too much. Thus, in 2017, the infection control team made the difficult decision to abandon ESBL screening. Our

disappointment was mollified only by the knowledge that approximately half of such patients required isolation for other reasons (MRSA/*C. difficile*), since double and triple colonization was not uncommon.

The debate about active ESBL surveillance continues. Zahar et al argued that enforcement of universal precautions and improved hand hygiene makes more sense and ultimately is likely to be a more effective strategy than “search-and-isolate,” for the following reasons:¹

- The cost of routine active surveillance is not insignificant (as mentioned earlier) and poses a considerable burden to the microbiology lab; such surveillance costs are not reimbursable by insurance or Medicare.
- The lag in retrieving results (which may be up to 48-72 hours) means that either individuals being screened must be isolated pending results — or those with ESBL colonization are not isolated initially.
- The frequency of false-negative surveillance samples may be as high as 25%, depending on technique and detectable levels of fecal colonization.
- Surveillance focused only on ESBL does not detect other MDRO,

such as carbapenem-resistant pseudomonas or *Acinetobacter baumannii* — two important hospital pathogens.

- Defining high-risk groups for screening may overlook those without recognized risk factors (e.g., prior SNF stay or prior travel or residence in Asia or a developing country).

- Limited studies suggest negligible transmission from asymptomatic carriers of ESBL-containing organisms in the acute care setting.

- The “human” cost of isolation is not insignificant, from the donning and doffing of gowns and gloves, to the occasional distress of patients being screened with rectal swabs, and then the challenging explanation of why “Granny is in isolation.” We have had some families so overreact that

they have prevented contact with the grandchildren.

- The authors argued that rather than being a useful clinical result, the detection of ESBL in perirectal swabs may contribute to the overuse of carbapenems.

- The authors argued that ESBL transmission in the critical care setting occurs “rarely” when hand hygiene compliance is maximized. With improved hand hygiene compliance, the authors of one study found little added value to the implementation of contact isolation on acquisition rates of Enterobacteriaceae in the ICU. Further, the use of single rooms and daily chlorhexidine body bathing also may reduce the risk of acquisition of potential pathogens.

The balance in favor of active surveillance for MDRO could shift if

more rapid and reliable (and cheaper, less labor-intensive) diagnostic tests were available. But, I wondered, if the risk of transmission of ESBL and other MDRO from asymptomatic individuals with stool carriage is ostensibly so low, as these authors argued, why is such a remarkable increase in ESBL colonization being observed in our local SNF population? ■

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Healthcare Worker Attitudes About Respiratory Protection: It's Complicated

Nurse: 'We could end up wearing masks all the time at work'

With this young century already seeing pandemic flu and outbreaks of severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), and Ebola, respiratory protection remains a critical and controversial issue.

In an unusual qualitative study,¹ healthcare workers revealed a variety of attitudes about respiratory protection equipment, including motivations and suspicions that could improve or undermine compliance.

“My background is in anthropology, so I think about the [work] culture of these different parts of the hospital. You want to have a safety culture that highly aligns with the protocols,” says **Gemmae Fix**, PhD, lead author and a researcher at the Center for Healthcare

Organization and Implementation Research in Bedford, MA.

Fix and colleagues conducted 12 focus groups with nurses and nursing assistants at four medical centers. They analyzed the themes and content of the “stories” told by focus group nurses.

The researchers sought to characterize perceptions of respiratory protection equipment (RPE) and assess how work factors may encourage or undermine use. They focused on registered nurses and nursing assistants, using a qualitative approach that solicited comments from these frontline workers.

Overall the main themes that emerged included:

- policies are known and seen during work routines;

- during protocol lapses, use is reinforced through social norms;

- clinical experiences sometimes supersede protocol adherence;

- when risk perception was high, there was concern about accessing supplies;

- emergency department (ED) workers were seen as ignoring protocol because risk was ever-present.

Mixed Message from the ED

Healthcare workers generally were aware of the importance of respiratory equipment and following protocols, they found. However, compliance could be undermined by inaccessible equipment, diagnostic confusion and

distrust, and observing ED staff not wearing masks routinely.

“Some of the stories we heard were specifically about the emergency department,” Fix says. “It was felt that the reason that people in the ED didn’t wear their masks as they should is that they just didn’t know [patient status]. They had all of these patients coming in without a diagnosis, and by the time they were given a diagnosis, the perception was it was too late — they had already been exposed. People from the ED work all the time without masks and when they go to other floors to bring patients, they are still not wearing masks.”

The primary focus of the group discussions was N95 respirators, which generally are recommended for airborne isolation precautions for pathogens like tuberculosis (TB) and measles. N95s also are commonly recommended for novel respiratory viruses like SARS and pandemic flu, as well as emerging infections like Ebola and MERS.

“Participants’ stories included a variety of cues prompting RPE use, including door signs on patient rooms, personal protective equipment carts in front of patient rooms, documentation in the electronic medical record, and patients being in a negative air pressure room,” the authors reported.

Wearing RPE consistently was recognized as “one of the things that you have to do,” though some complained the masks were “suffocating” and “claustrophobic,” Fix and colleagues reported.

Despite the discomfort, a common perception was that RPE was protective against occupational airborne infections.

“I wouldn’t want to wear [RPE] all the time,” a nurse in a focus group said. “But they’re manageable, and I’d

rather have them on than have them off.”

Stories underscored that it was socially acceptable among workers to identify RPE compliance lapses. For example, when a disoriented patient with TB unexpectedly came out of his isolation room coughing up blood and sputum, some nurses rushed to help. “Others told them, ‘Put on a mask! Put on a mask,’” Fix says.

In another focus group story, a food service worker went into a clearly designated airborne precautions negative pressure room without donning a respirator. “After informing this individual, the nursing staff reported the event to supervisors, who helped organize a respiratory precaution training for food service staff,” the authors reported.

‘Not Making That Mistake Again’

Beyond protocols, participants evaluated patient behaviors and symptoms to determine whether to wear RPE. This meant they might decide to use RPE even if protocol specified only droplet precautions or no precautions.

“Several healthcare workers we spoke with talked about wearing N95s when the protocol specified a surgical mask,” the researchers found. “This was because they suspected, based on their clinical experience, that the patient might later be diagnosed with a respiratory infection.”

One nurse stated: “I’m not going to make that mistake again.” In addition, some nurses wore RPE based on patient symptoms like coughing regardless of diagnosis and isolation level.

“It’s not just Ebola anymore,” one nurse said in focus group. “There’s a lot more viruses coming down the

pike. We could end up wearing masks all the time at work.”

Thus, when nurses did not trust the working diagnosis they relied on their own clinical judgment, which often led them to use a higher level of RPE, the study found. Inappropriate overuse can raise confusion and alarm in others, while depleting supplies of N95s for nonclinical reasons.

“The important thing here from a patient safety perspective is that they are not following the hospital protocol,” Fix says. “You can imagine if you work in a hospital — you know what the protocol is — and you see your colleague doing something different. Other colleagues in the emergency department may be doing what they want. This breaks the social norms and disrupts the safety culture.”

The researchers found a relationship between risk perceptions, perceived access to equipment, and local context. For example, nurses working in rural sites reported easily available equipment, a perceived lower risk of exposures, and fewer patients in airborne isolation.

In contrast, nurses in urban settings perceived a greater risk of exposure, more patients in airborne isolation, and respiratory equipment that was not easily available.

“They keep them [in another area] because they know how expensive they are,” a nurse told the researchers. “[Because] some people go to grab the yellow masks for droplet precautions and they might put on the N95 respirator for a droplet [by mistake].”

These perceptions and suspicions that costs trump worker protection can contribute to a toxic work culture.

“People talked about the hospital is trying to save money,” Fix says. “They thought they were at risk and wanted to get a mask, but the



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[personal protective equipment] was all the way down at the end of the hall. Or they were locked away, or they didn't have masks in the appropriate size. That undermines the worker's trust in that healthcare system."

Given these many variables that may influence respiratory use, Fix and colleagues recommended "team huddles" to review RPE issues when a patient is placed in airborne isolation. A review of the basics could open the huddles for other concerns about the use and availability of respiratory equipment.

"You have to be able to have conversations and address these

concerns out front for your patient safety culture," Fix says. "So not if — but when — the next [infectious agent] comes around, the system has that strong safety culture and is ready for these events. People want to do their jobs and they want to be safe. It's not so much an education problem. I would say it's a communication and perception problem." ■

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CME/CE QUESTIONS

1. In a clinical trial of six neonatal intensive care unit patients who were colonized with methicillin-resistant *Staphylococcus aureus*, how many had the same strain as their parents?
 - a. Zero
 - b. Six
 - c. Three
 - d. Four
2. In a survey of infection preventionists, a minority of respondents reported a strong climate of "psychological safety." Which of the following was cited as an example of an infection control practice in a workplace with psychological safety?
 - a. Hospital-wide surveillance for all pathogens
 - b. Nurse-initiated catheter discontinuation
 - c. Surgeon-specific infection rates made publicly available
 - d. Whistleblower reporting for compliance problems
3. Lakshman Swamy, MD, MPH, used which of the following terms to describe a surgeon asking for input from colleagues at a meeting?
 - a. Passive-aggressive
 - b. Detoxification
 - c. Situational humility
 - d. Situation Background Assessment Recommendation
4. A study found what percentage of asymptomatic carriers of *Clostridioides difficile* developed clinical *C. diff* infection within six months?
 - a. 38%
 - b. 17%
 - c. 50%
 - d. 72%