



# HOSPITAL INFECTION CONTROL & PREVENTION

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## ➔ INSIDE

**Bedside stewardship:** What can frontline nurses do to prevent antibiotic resistance? A lot. . . . 40

**New *C. diff* guidance:** Glove use emphasized due to hand hygiene woes . . . . . 42

**Whole genome:** New genetic capabilities for outbreak investigations . . . . . 44

**Hand hygiene and mortality:** A new study of nursing homes found that a multifaceted hand hygiene program reduced deaths . . . . . 45

**EDs overdosed:** U.S. emergency rooms are overrun with opioid patients, raising implications for infection control. . . . . 46

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## The Quest for Zero: Vanderbilt Awarded APIC Top Honor

*First infection control Program of Distinction*

By Gary Evans, Medical Writer

Recently recognized as having one of the best infection prevention programs in the country, IPs at Vanderbilt University Medical Center in Nashville are rapidly turning accolades into action.

“We helped APIC and CDC pilot some audit tools that will help smaller hospitals throughout the country,” says **Vicki Brinsko**, MSN, RN, CIC, FAPIC, director of infection prevention at Vanderbilt. “They can use these to audit processes like central-line dressing changes, urinary catheter care, high-level disinfection, and compliance in isolation rooms with PPE donning and doffing. We piloted

a bunch of these tools that they can adapt and adjust to make their system better.”

The infection prevention audit tools were expected to be made publicly available in the near future — Vanderbilt’s way of saying thanks for being recently named the first recipient of an award for excellence created by the Association for Professionals in Infection Control and Epidemiology (APIC). The APIC Program of Distinction is a new comprehensive designation created by the nation’s leading association of IPs.

“Being the first recipient of this program of distinction lets us be an

**INFECTION CONTROL AT VANDERBILT HAS MOVED WELL BEYOND THE HISTORICAL STEREOTYPE OF THE IP CRUNCHING NUMBERS IN SOME ISOLATED SILO.**

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example and a mentor for both APIC and other institutions to strive to become excellent," Brinsko says. "We are happy in this role and people call us on almost a daily basis. We strive to be an example for other hospitals, especially in the state of Tennessee."

Of course, Vanderbilt has the resources of a leading teaching hospital, but even IPs in small hospitals can achieve much by networking with other members of a profession that has a history of mentoring.

"The advice I would give to other IPs is don't hesitate to reach out to other people," she says. "You are not in this boat alone. You may think you are if you are a new IP, but reach out to APIC and your state organizations. There are plenty of people who want to help."

## The One and the Many

"I think that one of the strengths of our program is that we don't limit infection control to just the IPs," Brinsko says. "We spread it out. We have partners in infection prevention who were evident and who supported us throughout this survey process for the program of distinction."

That includes colleagues in environmental health and safety, occupational health, facilities management, and plant services, she says.

"We are working together for one goal: quality patient care and safe patient care," she says. "We also partner with our quality consultants. Infection prevention is part of the quality umbrella, and we do safety rounds with our quality partners on a weekly basis through every single patient unit."

In this sense, infection control at

Vanderbilt has moved well beyond the historical stereotype of the IP crunching numbers in some isolated silo.

"This also goes all the way down to the staff nurse — the frontline people fighting infections every single day," Brinsko says. "I think that is one thing the surveyors noted, that infection prevention is not limited to a single department — it goes out to the staff level."

As an example of excellence, one of the APIC surveyors says the hospital has a state-of-the-art tracking system for instruments subject to high-level disinfection and sterilization.

"They have bar coding and computerization of the entire process," says **Terrie Lee, RN, MS, MPH, CIC, FAPIC**, strategic and clinical lead for development of the APIC Program of Distinction. "They were showing us that they can take an instrument, look in a computer, and tell where it is — whether it is in reprocessing or on a tray in an OR. It was a very clear process and we could see all of the problems that this would avoid."

This focus and collaboration at VUMC extends to the bane of the infection preventionist: hand hygiene, or the lack thereof. Non-IP staff members are recruited as "secret shoppers," collecting hand hygiene data on their respective units. The hand hygiene observation data can be entered via an app on a smartphone, a method particularly effective for engaging younger workers, Brinsko says.

"It's a quick and painless phone app," she says. "It sends it to a spreadsheet and we feed that data right back to the units on a daily basis. In fact, they can pull their own data from our dashboard, which they love because it's

electronic. Some people prefer to have a report pushed to them, so they do both.”

Hand hygiene compliance data is reported by unit level and job type, but does not identify individual healthcare workers. Data broken down to the unit level is sufficient to stir awareness and competition, but the critical step is to report what you collect.

“We don’t keep data to ourselves or collect data and not share it,” Brinsko says. “I think that is a key that some programs might miss. If you are going to collect data — share it. We feed that data back to the end users and they can see how well they are doing for compliance purposes.”

## C-suite Support

The Program of Distinction is a three-year designation of excellence based on the APIC Standards of Excellence for Infection Prevention and Control. While guidelines typically set minimal thresholds, the APIC standards establish levels of excellence in such areas as surveillance, hand hygiene, outbreak investigation, patient isolation, emergency management, employee health, and antibiotic stewardship.

In a process that is somewhat akin to the oversight of accreditation agencies, the Program of Distinction includes a rigorous application and review process, followed by a site visit by APIC IPs.

Achieving and maintaining the distinction will require administrative support, something infection control programs have historically struggled to obtain. The APIC designation includes such marketing tools as award plaques and label pins recognizing infection prevention excellence, which could

be appealing to administrators wanting to underscore the message of patient safety.

“We need the involvement of the entire organization to have a successful infection prevention program,” Lee says. “That is so key. If we don’t have that, we are not going to be able to have excellent patient outcomes. That’s something that IPs across the country talk about — how discouraging it is to be held accountable when you cannot get adherence to the processes that will improve the situation. Until you have that team approach in hospitals, you are not going to reach this level of distinction.”

APIC hopes to extend the Program of Distinction to more than 1,500 facilities over the next five to seven years. That said, the distinction status will only be awarded to programs that meet the high standards set forth by the association. Those that apply and fall short will receive a gap analysis to pinpoint areas for improvement.

“We have a very comprehensive, stringent process and that’s really what will dictate the number of facilities,” says **Leslie Kretzu**, executive director of APIC Consulting Services, Inc. “But we certainly are getting the word out and the interest has been great.”

## APIC on the Move

The Program of Distinction honor is one of several APIC efforts to revitalize and professionalize the field while reaching out to a new generation of practitioners, says **Janet Haas**, PhD, RN, CIC, FSHEA, FAPIC, 2018 APIC president. The profession is approaching a demographic faultline as career IPs start to leave the

field. APIC is looking at a younger demographic of healthcare workers in terms of striking and maintaining an interest in the importance of infection control.

“We want to really move that to a leadership mindset,” she says. “We know that our niche has also been the surveillance and the knowledge about the processes to prevent infection, but we really have to move the needle and make things better by being ‘interventionists’ on behalf of our patients.”

As part of this effort, APIC will hold a “future” conference later in 2018, in addition to its annual educational conference, which this year is slated June 13-15 in Minneapolis. The new conference still is in the planning stages, but Haas says it will be on “the future of infection prevention within the context of the future of healthcare. How can we best serve people, patients, and families over the continuum of care in the future?”

In addition, the second iteration of the APIC MegaSurvey will be conducted next year, following up on the 2015 poll of thousands of IPs. As part of this effort, the 2012 APIC Competency Model that outlined the IP skill set is under review for possible revision.

“We are focusing on behavior change, culture change, and project management skills,” Haas says. “We are trying to get into the hearts and minds of this next generation of IPs and see what makes this work meaningful for them. Some of our original members are heading toward retirement.”

While some of the old guard may have said they did not need CIC certification, there is an expectation of earning this marker of professionalism among incoming IPs, she says. “Certification

is important to really show commitment to the profession and that you are competent to do this work on behalf of patients, wherever they are in the healthcare settings,” she says.

“The younger people getting into the field expect that they are going to have to be certified. We’ve certainly seen, on the clinical side, the impact

on patient outcomes. We have seen from some of the studies that if you have a certified IP you are more likely to be following evidence-based practices.”

As with these other aspects of infection prevention, the Program of Distinction requires recipients to update their improvement processes annually to prepare for recertification

in three years. The idea appeals to Brinkso, who sees infection prevention as less a destination than a journey.

“You don’t say one and done,” she says. “You keep moving toward that zero mark.”

*More information on the APIC Program of Distinction is available at: [www.programofdistinction.org](http://www.programofdistinction.org). ■*

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## Antibiotic Stewardship Begins at the Bedside

*Nurses can play a surprisingly important role*

**A**ntibiotic stewardship programs in hospitals have become a critical priority to stave off multidrug-resistant organisms. However, when public health officials initially began sounding the alarm about the issue, some infection preventionists — and certainly bedside nurses — felt this was not in their sphere of influence.

The common reaction, somewhat understandably, was that antibiotic stewardship should be the purview of physicians and pharmacists who prescribe and handle the drugs.

“When we first started our antimicrobial stewardship program, I asked myself the same question of why I needed to be involved,” said **Chris Shakula**, MS, RN, CNS-BC, CIC, an IP at Franciscan Health Hospital in Crown Point, Indiana. “In my role as an infection preventionist I do not prescribe medications, so why did I need to be involved and did I really need one more item added to my list of things to do? As I learned more about antibiotic stewardship, I realized how important it was for me and for nurse leaders to be engaged.”

Speaking at a recent webinar held by the American Nurses Association and the CDC, Shakula also stressed her new appreciation for the role

of the bedside nurse in antibiotic stewardship.

“I have learned how much nurses are already doing at the bedside related to antimicrobial stewardship,” she said. “We need to let management know why nurses need to be involved.”

Indeed, many basic elements of nursing influence whether antibiotics will be prescribed appropriately and discontinued when medically indicated.

“Proper specimen collection is a topic I cover in our nursing education,” Shakula said. “Several nurses didn’t realize how much is affected by culture results. Those results may affect whether or not a patient receives an antibiotic. They may affect the length of stay of a patient if additional testing is needed.”

This point was underscored with clinical detail by co-speaker **Barbara A. S. Gilbert**, MSN, RN, CIC, an IP who represented the Academy of Medical-Surgical Nurses in the webinar.

“Obtain appropriate cultures using proper techniques before starting antibiotics,” she emphasized. “For example, for blood cultures, disinfect the bottle top with 70% isopropyl alcohol. Clean the puncture site with

alcohol, followed by chlorhexidine gluconate, and allow it to dry. Then collect the appropriate quantity of blood — for adults that’s 10 ccs to 20 ccs for each blood culture set.”

For sputum cultures, she said, “Have patient rinse with water to remove excess oral flora; instruct them to cough deeply and collect and transport in a sterile container.”

Such clinical minutiae and raised awareness at the bedside is a long way from the typical top-down approach of issuing guidelines and telling everyone to comply.

In that respect, with nurses as the target audience, the ANA/CDC antibiotic stewardship webinar is a step in the much-desired direction of making infection prevention the responsibility of the entire staff.

The webinar was based in part on an ANA and CDC joint white paper that stressed the importance of getting bedside nurses engaged in antibiotic stewardship.

One of the overall goals in nursing education is to teach prevention of antibiotic resistance as part of basic clinical practice.

“Under this model, microbiology and pharmacology principles that are the foundation of antibiotic stewardship would seem less divorced

from the daily care of patients,” the ANA/CDC paper states.<sup>1</sup>

## Educating Patients

“Prevent infections from the get-go by following infection control practices like hand hygiene, and [removing] invasive devices such as central lines — even peripheral IVs — and urinary catheters as soon as possible when no longer needed,” Gilbert said. “I tell patients and family members that any invasive device is an opportunity for germs to jump in. The sooner we can get rid of them, the better.”

Educate patients and their families about preventing infections, keeping scrapes and wounds clean, and managing chronic conditions, she added. “Tell them when antibiotics are not necessary, especially if they demand them,” Gilbert said. “Tell them to complete antibiotics once prescribed, and not to share antibiotics or take those not prescribed to them.”

In addition, take a detailed allergy history of patients, she said, noting that penicillin allergies may be a red flag for the subsequent appearance of antibiotic-resistant organisms, longer hospital stays, and increased costs.

Ensure antibiotics are started promptly and reviewed once culture results are available, she advised. Talk to the clinical team about antimicrobial usage, including de-escalation of drugs and changing from IV to oral antibiotics, she said.

“Medication administration is important,” Gilbert said. “As an example, I remember when a provider ordered an IV medication for a patient with *C. diff*. Medication for *C. diff* works better if it goes through the gut [orally].”

Nurses should review microbiology results and sensitivities for ordered antibiotics.

“Is the bacteria sensitive to the prescribed antibiotic?” she said. “Similarly, nurses should try to be aware of the indication and intended duration of antibiotics.” Notify the physician or a pharmacist of any adverse effects or if the patient refuses to take antibiotics, she said.

“Verify the antibiotic schedule when the patient transfers,” Gilbert said. “Make sure that this is part of your patient handoff.”

## Involving Nurse Leaders

Representing the National Association of Clinical Nurse Specialists, Shakula reviewed some of the reasons antibiotic stewardship is a critical issue for nursing and healthcare leaders.

Antibiotic stewardship is a patient safety issue, she said, noting that the indiscriminate use of drugs drive increases in a host of multidrug-resistant organisms, from MRSA to some of the emerging gram-negative pathogens such as carbapenem-resistant Enterobacteriaceae (CRE).

Another patient safety issue that is somewhat unique to antibiotics is that misuse of antimicrobials in one patient may select out resistant organisms that spread to another patient.

“Most treatment or actions in healthcare only affect one patient, but antibiotics affect everyone,” Shakula said.

“The patient taking the antibiotic may not be the only one affected by it. Resistant organisms can be spread from person to person by poor hand hygiene and by inanimate objects that are not cleaned and disinfected appropriately,” she added.

Antimicrobial resistance also affects nursing workflow, even if it is something as basic as having to

put a patient on an IV antimicrobial medication versus an oral pill, she said.

“Patients that are on antibiotics that are not de-escalated in a timely fashion may have longer hospital stays,” she added. “Patients with contaminated specimens may have longer hospital stays and be exposed to antibiotics that aren’t needed.”

Nursing involvement in antibiotic stewardship also is being required by several regulatory and accrediting bodies, she emphasized. These include The Joint Commission and the Healthcare Facilities Accreditation Program.

“Antimicrobial stewardship is also part of pay for performance and value-based purchasing [by] the Centers for Medicare & Medicaid Services,” Shakula said.

“The CMS has a proposal to make antimicrobial stewardship a Condition of Participation. Some insurance companies have also added it as an indicator on which they base payment.”

Through the clinical and patient care work they do every day, “nurses are already a part of antimicrobial stewardship,” she said.

“Leaders need to ensure they are engaged in antimicrobial stewardship programs and understand why their participation is vital.”

On this point, Gilbert added, “Be at the table of the antimicrobial stewardship committee. Invite yourself if you need to.” ■

## REFERENCE

1. ANA, CDC. Redefining the Antibiotic Stewardship Team: Recommendations from the American Nurses Association/Centers for Disease Control and Prevention Workgroup on the Role of Registered Nurses in Hospital Antibiotic Stewardship Practices. 2017: <https://bit.ly/2IIYloG>.

# New Guidelines for the Formidable Challenge of *C. Diff*

New first-line drugs, fecal transplant for recurrent cases

Though it may eventually be eclipsed by the emerging multidrug-resistant gram-negative pathogens, *Clostridium difficile* is, for all intents and purposes, the tyrant king of healthcare infections.

It's close to a literal gut punch, typically setting up as an enteric infection after healthy, commensal bacteria have been blasted away by indiscriminate broad-spectrum antibiotic use. In particular, the NAP1/027 *C. diff* strain is highly virulent and toxigenic, causing a miserable panoply of symptoms from recurrent diarrhea to life-threatening breakdown of the colon.

"The most common bug acquired in the hospital, *C. diff* kills 15,000 to 30,000 people every year and costs more than \$4.8 billion a year in hospitalizations alone," according to new guidelines issued by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America.<sup>1</sup>

With input from the CDC, the IDSA and SHEA guidelines recommend fecal transplant for recurrent cases, outline new testing strategies, and recommend new first-line antibiotics. Updating the 2010 guidelines, the recommendations still emphasize glove use as the most important infection control measure, as hand-washing with alcohol and even soap may not eliminate *C. diff* spores from hands.

**L. Clifford McDonald, MD**, co-chair of the IDSA/SHEA *C. diff* guidelines panel, is the associate director for science in the CDC Division of Healthcare Quality Promotion. *Hospital Infection Control*

and *Prevention* asked him to comment on some of the recommendations in the following interview.

## Q&A

**HIC:** *C. diff* has been recognized as a major threat to patient safety for several years now. Have you been able to make much progress in reducing it and is the NAP1/027 strain still causing the majority of severe infections?

**McDonald:** We have seen some decline, but not nearly what we want to see. The standard infection ratio for the hospital-onset infections is surveyed in [the CDC's] NHSN. That came down 8% by 2014, and from 2015 to 2016 there was another 8% decline.

You could say that maybe we are at a 15% to 20% decline, but we really wanted to see at least a 30% decline at this point. So, we are not moving as dramatically as we should. The 027 strain is the main source we see in our Emerging Infections Program — 10 sites across the U.S. with 14 million people under surveillance. The 027 is the most common strain for healthcare settings, which includes hospital-onset disease.

**HIC:** Antibiotic stewardship has certainly been heavily emphasized of late. Are you seeing any signs that more prudent use of antibiotics is having an impact?

**McDonald:** When you sort it out by comparing our antibiotic use measures to England, for example, we are still using a lot of fluoroquinolones. [Reductions

might be critical] for this 027 strain in particular because it is fluoroquinolone-resistant. But we know that the cephalosporins are also bad characters.

We have not seen antibiotic stewardship linked to reductions in a big way, and part of that is because we are starting out behind the 8 ball with a lot of antibiotic use. That said, there have been hospitals that have reduced specific antibiotics and have seen declines in their *C. diff* rates. We are doing some of that analysis now, but it is not out yet. There are hospitals that reduced their fluoroquinolone use and others that have reduced their cephalosporin use, and that has been associated with declines. So, it does work, but we need to see much more.

**HIC:** The *C. diff* guidelines recommend testing patients with new onset of unexplained diarrhea, defined as three or more unformed stools in 24 hours. It is also noted that molecular tests are used in more than 70% of hospital labs, but these tests have pros and cons.

**McDonald:** We didn't come out in this guideline and talk about "diagnostic stewardship," but I think that is something you will hear more about. The WHO is using that term. With any test for any condition, the results always have to be considered in the context of the patient tested. Any test will suffer if you order it for the wrong patients.

In the case of the nucleic acid application test — the PCRs — they are very sensitive. They are great for ruling out disease. But if they are positive, it does seem that patients can have diarrhea for other causes.

In fact, one study found that 19% of patients who were getting a *C. diff* test ordered were on laxatives. So that kind of thing — not paying attention — [is a problem]. In looking at the criteria for ordering a test, it is three unformed stools of diarrhea which is unexplained. If someone is on a laxative that causes diarrhea, ordering a *C. diff* test is circumspect.

**HIC:** There is a new recommendation for fecal microbiota transplantation, the transfer of healthy stool from a donor in an attempt to restore healthy gut bacteria and eradicate *C. diff* in the recipient.

**McDonald:** We recommend it for patients with multiple recurrent *C. diff*, so that is new. It is for patients with multiple recurrent *C. diff* who have failed appropriate antibiotic therapy. That is “appropriate” antibiotic therapy, and we lay out some new recommendations for treating primary *C. diff* and recurrences.

**HIC:** Yes, the guidelines include new recommendations for treatment, including dropping metronidazole as a first-line drug in favor of oral vancomycin or fidaxomicin.

**McDonald:** Another big change in this guideline is that we have moved metronidazole to no longer recommended as a first-line therapy. Metronidazole can be used if oral vancomycin or fidaxomicin are not available, but those other two agents are the recognized first-line therapy.

Recurrence of *C. diff* is a big problem. About 20% of patients who are adequately treated for primary *C. diff* will go on to develop a recurrent infection. A good take-home message is after the first recurrence, do something different. If they received metronidazole for some reason as the first-line drug, don't use that again. If they had oral vancomycin for 10 days — which is the recommended

time — then try to taper it down or try fidaxomicin. We offer some things to try, so we put out more recommendations dealing with recurrence, which include finally FMT for multiple recurrence in patients who have failed appropriate therapy with antibiotics. [FMT] is a new general area along with the diagnostics — those are the two big areas of change.

**HIC:** The role of probiotics in controlling *C. diff* remains unresolved in these new guidelines.

**McDonald:** We don't recommend against it, but we say there is insufficient data to make a recommendation. I think it is worth noting, because certainly there have been several meta-analyses that suggest there is a role for probiotics in preventing *C. diff*.

We are not necessarily denying that. A recent Cochrane Review recommends this, but we are stuck with the fact that there is no single probiotic formulation that has been studied sufficiently to make a guideline recommendation to “use this probiotic in this dose for this period of time in these patients to prevent *C. diff*.” That's what you need to make that kind of recommendation.

## Lack of Options

**HIC:** But you decided there was enough evidence to recommend fecal transplant?

**McDonald:** Part of it is the [limited] number of options available. Probiotics would be for prevention, and we know a lot of other ways to prevent *C. diff*, like antibiotic stewardship. When you get a patient with multiple recurrences who has failed antibiotics, there are not many options. [FMT] has been shown to help a lot of people. A couple of

randomized control trials suggest it does work. A lot of patients have received it, and so far, there has not been a safety concern.

But at the same time we know that it is not a standardized product, obviously. Human stool used for this purpose is considered a drug by the FDA. They have made that clear, so normally this use would require an investigational new drug [approval], but they have agreed to apply enforcement discretion, meaning for this particular reason it can be used. That's why we felt like we could recommend it for a subset of patients who fail everything else.

**HIC:** In terms of infection control, is there still an emphasis on glove use due to the historical problem of removing spores from hands?

**McDonald:** This does include infection control, but there are not a lot of changes there. We do recommend extension of *C. diff* isolation to 48 hours after resolution of diarrhea. That was in the SHEA isolation guideline. There is an emphasis on gloving.

All our infection control guidance is focused on infection control of symptomatic *C. diff* patients diagnosed with disease. We do talk about asymptomatic carriers but we don't have any recommendations in that area. It is an area of active research. For the patients with symptomatic *C. diff*, gloves are first and foremost. That is clear. The question then becomes: How do you do hand hygiene upon glove removal?

**HIC:** That raises some issues we have certainly discussed in the past about hand hygiene and *C. diff*.

**McDonald:** There is a theoretical benefit for soap and water over alcohol-based hand sanitizers. Alcohol does nothing to *C. diff* spores — we know that. With that said, it is not

just *C. diff* we are concerned about. We are worrying about any kind of organism that can affect the patient. There are many other threats out there that are more effectively killed with alcohol than soap and water. Then you look at some of these studies of [the difficulty] of getting the spores off the hands even using soap and water, and you realize gloves are first and foremost. Soap and water can

also have problems with compliance. In this guideline, we say perform hand hygiene after glove removal with either soap and water or alcohol-based hand rubs. Then we have another recommendation that if you have sustained high rates or an outbreak, then use preferentially soap and water. It is a theoretical benefit, but has never been shown in and of itself to reduce *C. diff* transmission. ■

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# The Whole (Genome) Picture: New Tools for Outbreaks

*Genetic markers can show the path of transmission*

New whole genome capabilities are opening a wide window of molecular epidemiology, as heretofore unidentifiable genetic markers can reveal paths of transmission between patients and facilities in an outbreak.

In a fascinating bit of detective work, researchers revisited a 2008-09 outbreak of Carbapenem-resistant *Klebsiella pneumoniae* (CRKP) that moved across the continuum between all manner of facilities in the Chicago area. One of the original investigators, **Mary K. Hayden**, MD, an infectious disease physician at Rush University Medical Center, saved the isolates. The original outbreak investigation identified 42 patients with CRKP in 14 hospitals, two long-term acute care hospitals (LTACHs), and 10 nursing homes.

However, the path of transmission as the emerging pathogen moved between facilities was not completely understood. Enter the Center for Microbial Systems at the University of Michigan, which conducted whole genome sequencing on the isolates as described in a recent paper.<sup>1</sup>

“When we were first investigating this back in 2008-2009, we could tell

from electrophoresis that it looked like there was a single strain that came into the region,” Hayden says. “But that was not a discriminating enough tool to differentiate among isolates that might have changed in small ways over time.”

With whole genome sequencing, the chromosome of the bacteria that is common across an outbreak can be broken down in much greater detail.

“It is both more discriminating and can tell you the timing — it can actually tell you, for example, whether a particular mutation occurred before another mutation,” she says. “You can track the changes over time.”

An isolate of a patient who was thought to have introduced CRKP to the region was analyzed by this new technique, clearly showing how transmission began.

“We had the isolate and included it in the whole genome sequence analysis,” Hayden says. “We could identify with that analysis that the patient was probably ‘patient zero.’ The whole genome sequencing method showed that the first patient entered the region right around the first part of the year in which we started seeing the isolates.”

With multidrug-resistant strains emerging and transferring between facilities with transferred patients, whole genome sequencing is a powerful addition to outbreak investigation.

“There was a situation at one acute care hospital where we identified five isolates within a very short period of time,” Hayden says.

“When we did the original investigation, we assumed that there was one introduction to the hospital and then four transmissions. They all looked the same by pulse field and they all appeared within a fairly short period of time.”

To their surprise, the whole genome sequencing showed that this cluster was comprised of three separate introductions of CRKP, with only two transmissions occurring in the hospital, she says.

“If we had that information back then, we might have been more aggressive about screening patients at the time of admission and taking precautions to prevent cross-transmission in the hospital,” says Hayden, who also directs the clinical lab at Rush.

“The extra step we could have taken is screening upon admission.”

Similarly, the transferring institutions could be alerted to the problem, taking action to prevent transmission before other patients go on to seed infection in other facilities.

“It is really whole genome sequencing combined with the classical epidemiology,” she says.

For example, public health interventions could have been taken at a nursing home that was suspected as serving as a reservoir for the pathogen, she says.

“When we looked again, combining the epidemiology and the whole genome sequencing, we had enough evidence to identify that this nursing home may have been the initial incubator [of CRKP] rather than the LTACHs,” Hayden says.

In an interesting aspect of the study, Hayden and colleagues overlapped the new detailed isolates with their original investigation and

case finding, watching the genetic changes that showed transmission as the outbreak unfolded in real time.

“Would it provide additional information in that moment — with just the isolates in real time? In fact, it did,” she says. “By the time we had the second or third isolate, there was substantial information provided by whole genome sequencing to be able to tell us where these came from. What I’m saying is, even if they came from three different facilities, you could see that they were related. And the way that they were related would allow you to identify the problem facility to investigate.”

The approach is ideal for tracking emerging pathogens in healthcare networks, but also could have utility in investigating outbreaks of established bugs.

“It’s more complicated when you have an endemic organism, but I think it could still be quite useful,” she says.

The equipment needed to

perform whole genome sequencing is becoming more affordable, so that more teaching hospitals and public health departments may begin using the method for outbreak investigation. For example, one manufacturer has instruments that perform whole genome sequencing for less than \$20,000, Hayden says.

“Yes, that sounds like a lot of money, but I’m the director of a laboratory and that is not a terribly expensive piece of equipment for a clinical laboratory in a university setting,” she explains. “The costs are really declining.”

Beyond outbreak investigations, detailing the whole genome of important pathogens will have other benefits, she adds.

“If you think about it, when you do whole genome sequencing you get information about resistance genes, virulence genes,” Hayden says. “It is a lot more information that might be useful to inform public health from an epidemiological standpoint.” ■

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## Wash Your Hands — or People Die

*Your mother — and Semmelweis — was right*

**T**hough it is a practice as often ignored as observed, hand hygiene remains the cardinal principle of infection control. The cross-transmission of pathogens between patients due to transient colonization on healthcare workers’ unwashed hands has caused many infections, some of them fatal.

We know intuitively that this worst of all outcomes is possible, but hand hygiene compliance is not typically linked to mortality data.

However, a new study in 26 French nursing homes found that a multifaceted hand hygiene program

including staff, residents, and visitors did indeed reduce mortality.

From April 1, 2014, through April 1, 2015, researchers randomly assigned 13 nursing homes to an intervention group, with the other half serving as the control arm.

The hand hygiene intervention eased compliance by distributing pocket-sized alcohol hand rub dispensers. New wall dispensers were added in the facilities and the awareness effort included education and posters.

In addition, each facility participating in the intervention

formed a small hand hygiene work group to focus on the problem.

The intervention group that emphasized hand hygiene measures had 21% less mortality than the control group. Of particular note, the mortality reduction rose to 30% during a three-month period in 2015 when France was experiencing a severe flu outbreak.

Improved hand hygiene also had a downstream effect of reducing antibiotic prescription rates in the intervention group, which, not surprisingly, also had higher use of hand hygiene rubs during the study.

For two months prior to the study, this product-used measure was roughly equal between the facilities in both research arms.

Unfortunately, the evidence of reduced mortality faded as the hand hygiene emphasis was discontinued. This inability to “sustain the gain” is typical of hand hygiene interventions, as compliance often reverts to baseline after the quality improvement effort is stopped. Nevertheless, the study shows that hand hygiene can save lives, a connection that was originally made by the 19th century physician who first proved the efficacy of the practice.

“Usually, it is very hard to say that the reason people died was lack of hand hygiene,” says **Janet Haas**, PhD, RN, CIC, FSHEA, FAPIC, 2018 APIC President. “Other than Semmelweis, who did a nice job with that, and that’s how this whole thing started.”

Indeed, Hungarian physician Ignaz Semmelweis (1818-1865) famously made the connection between hand hygiene and mortality when trying to stop an outbreak of puerperal fever in women at childbirth. As noted in

the medical literature, “he ordered a new handwashing procedure as an experiment. All medical students were instructed to wash with chlorinated lime before any examination. The fever deaths promptly declined.”<sup>2</sup>

As IPs are aware, the story does not end well. Semmelweis was something of a prophet unwelcomed in his own land, drawing widespread scorn from colleagues who felt they were being blamed for patient deaths. This was in an era before the germ theory — which, of course, subsequently established that Semmelweis was right.

The specific pathogen causing the deaths of the women at childbirth was identified as *Streptococcus pyogenes*.

While hand hygiene is an area of ongoing emphasis in hospitals, particularly since the widespread adoption of alcohol hand rubs over soap and water, nursing homes are becoming a focus of increasing infection prevention.

According to APIC, U.S. nursing homes report some 3 million infections per year, suggesting hand hygiene efforts like

those demonstrated in the French study could have a major impact.

“We definitely know that [lack of] hand hygiene is linked to hospital infections, but people are also at risk in these non-acute care settings,” Haas says.

“In nursing homes, it is little bit easier to assess [hand hygiene] than in hospitals, where there are so many things going on that are invasive and interventional for patients in acute care,” Haas adds.

“When you get into the nursing home settings, it is really where people live, and so community infections can spread to this vulnerable population. We know that hand hygiene is a way to [prevent] that.” ■

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## Hospitals Besieged by Opioid OD Patients

*Some 115 opioid patients die every day*

**W**ith U.S. emergency rooms being overrun with opioid patients, the national epidemic is putting pressure on myriad aspects of healthcare delivery. Infection prevention is no exception.

As we have previously reported in *Hospital Infection Control & Prevention*, the opioid epidemic overlaps with the longstanding

problem of addicted healthcare workers diverting drugs such as fentanyl, sometimes causing hepatitis outbreaks among patients by contaminating vials and syringes.

In addition, opioid-addicted patients admitted to hospitals have seeded their own infections by spiking their IV lines with street drugs.

Moreover, investigators recently reported that opioid use predisposes people to invasive pneumococcal disease.

They analyzed patient records and pharmacy prescriptions, finding a connection between opioid use and infection as defined by the isolation of *Streptococcus pneumoniae* from a normally sterile

site. Opioid use is a “novel risk factor for these diseases,” they concluded.<sup>1</sup>

In another disturbing development, first responders and frontline nurses have had to be revived by an opioid antidote after coming in contact with contaminated opioid patients.

Some of this is thought to occur because street drugs are being cut with powerful synthetic opioids, some many times more potent than anything typically used in a hospital.

The opioid epidemic has reached unprecedented levels, with an estimated 63,000 overdose deaths in 2016, the Centers for Disease Control and Prevention recently reported.<sup>2</sup>

“We’re currently seeing the highest drug overdose death rates ever recorded in the United States, driven by prescription opioids and by illicit opioids such as heroin and illicitly-manufactured fentanyl,” **Anne Schuchat**, MD, CDC acting director, said at a recent news conference.

“This means that, on average, 115 Americans died each day from an opioid overdose involving prescription or illicit opioids in 2016.”

In data reported from July 2016 through September 2017, the CDC found that emergency department visits in 45 states showed that opioid overdoses are increasing across all regions.

“Out of 91 million emergency department visits, there were 142,557 suspected overdoses involving opioids,” Schuchat said.

“Opioid overdose emergency department visits increased about 30% overall in this national system,” she added.

“We saw increases in cities and towns of all types from the third quarter 2016 to the third quarter 2017.”

While the overdose deaths are shocking, the nonfatal cases have considerable impact as well, she noted.

“For every fatal case there are many more nonfatal cases, each one with its own emotional and economic toll,” she said. “Research shows that people who have had at least one overdose are more likely to have another.”

The CDC is working with hospital EDs to refer these surviving addicts for subsequent treatment.

“Take steps toward preventing

a repeat overdose, ideally [by] alerting community partners to opportunities to improve prevention in the surrounding areas,” she said.

On a personal note, U.S. Surgeon General **Jerome Adams**, MD, MPH, said his brother has struggled with addiction for decades.

“I often contemplate the fact that it could have been me,” Adams said at the press conference.

Getting the opioid antidote naloxone in the hands of first responders and community members is an immediate priority, followed by public education and destigmatization of addiction, he said. ■

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## CME/CE QUESTIONS

- 1. Vicki Brinsko, MSN, said Vanderbilt recently pilot-tested some auditing tools for which processes?**
  - a. Central-line dressing changes
  - b. Urinary catheter care
  - c. High-level disinfection
  - d. All of the above
- 2. Which of the following was cited as a potential red flag for the subsequent appearance of antibiotic-resistant organisms, longer hospital stays, and increased costs?**
  - a. Obesity
  - b. Diabetes
  - c. Penicillin allergy
  - d. Viral co-infection
- 3. According to the CDC's L. Clifford McDonald, MD, which of the following antibiotics is recommended as the first-line drug for *Clostridium difficile*?**
  - a. Vancomycin
  - b. Metronidazole
  - c. Fidaxomicin
  - d. A and C
- 4. In a study of French nursing homes, a multifaceted hand hygiene program reduced mortality by how much during the 2015 flu season?**
  - a. 30%
  - b. 41%
  - c. 20%
  - d. 50%

## CME/CE OBJECTIVES

Upon completion of this educational activity, participants should be able to:

1. Identify the clinical, legal, or educational issues encountered by infection preventionists and epidemiologists;
2. Describe the effect of infection control and prevention issues on nurses, hospitals, or the healthcare industry in general;
3. Cite solutions to the problems encountered by infection preventionists based on guidelines from the relevant regulatory authorities, and/or independent recommendations from clinicians at individual institutions.