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Pediatric ICUs Make Headway Against Infection

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FOR THE SICKEST infants and children, pediatric intensive-care units provide the highest level of medical care, treating children after complicated surgeries, severe illness or accidents. But the very catheters, intravenous lines and invasive medical procedures used to keep children alive are also putting them at higher risk of bacterial infection.

Now, with mounting alarm about the high rate of hospital-acquired infections, critical-care specialists are taking new steps to protect the smallest and most vulnerable patients, challenging the prevailing wisdom that infections are simply inevitable in a busy and stressful intensive-care environment.

THE INFORMED PATIENT

The nonprofit National Association of Children's Hospitals and Related Institutions, with 208 member hospitals in the U.S. and overseas, is leading an ambitious effort to eradicate bloodstream infections, the most severe infectious threat in pediatric ICUs. In the first six months of the three-year project, 29 participating hospital units have slashed infection rates by close to 70% by adhering to a rigid set of measures shown to prevent infection in children, including far more rigorous care of catheters, higher sterile precautions, and constant assessment of the need for keeping catheters in place.

Pediatric intensive-care units also are adopting new programs to sharply reduce or eliminate urinary-tract infections for children with bladder catheters, and pneumonia for children on ventilators, the two most prevalent complications after bloodstream infections.

While infections have always been a risk for hospital patients of every age, experts say that children may be at even higher risk than adults. Until now, though, prevention efforts have focused largely on adults, and measures that are known to prevent infection in children aren't always consistently used, experts say.

Preventing Pediatric ICU Infections

The following are some of the elements that health care professionals administering catheter insertion must perform:

Insertion Bundle:

- Wash hands with antibacterial soap and water or waterless hand cleaners prior to insertion.
- Use a 2% chlorhexidine (CHG) scrub at insertion site; scrub for 30 seconds; unless groin, then scrub for two minutes; allow to air dry for 30 to 60 seconds.
- All participants in line placement at bedside must wear mask, cap, sterile gloves and gowns.

Maintenance Bundles:

- Assess daily whether catheter is needed.
- Perform catheter site care including scrubbing of area and dressing change if necessary
- Assess the need to change tubing and add-on devices for the central line
- Complete fluid administration within 24 hours of initiating infusion

Source: National Association of Children's Hospitals and Related Institutions

Over the past few years, hospital bugs have become increasingly resistant to common antibiotics, striking two million patients and claiming 100,000 lives annually. There are no precise statistics on how many of those deaths are infants and children. But a review of published literature last month in the journal *Pediatric Critical Care* by Jana Stockwell, a pediatric critical-care physician at hospital operator **Children's Healthcare of Atlanta**, concluded that infections can strike as many as 16% of children in pediatric units—a higher rate than in many adult ICUs—and increase the risk of death by up to 20%.

Studies also show that treating an infection can add nearly \$40,000 in additional hospital costs.

"These kids are at incredible risk for infection, with thin skins that provide a poor barrier to infection and immature or severely compromised immune systems," says Paul Sharek, chief clinical patient-safety officer for **Lucille Packard Children's Hospital** at Stanford University, which has made reducing catheter-related infections its No. 1 goal for the past two years. Even though the steps for preventing infections are fairly routine, he adds, "it's easier said than done, and involves massive cultural shifts" for medical staff who are used to handling medical procedures their own way.

Catheters are a big focus of such efforts because they require an invasive procedure that could allow bacteria to enter the body. Nachri's bloodstream-infection prevention effort is relying on so-called "bundles" of catheter insertion and maintenance protocols that have already been shown to save lives and costs.

Children's Healthcare Corp. of America, a supply-purchasing cooperative of 42 children's hospitals, pilot-tested the bundles in 2005. The goal was to cut bloodstream infections by 50%, to 1.5 infections per 1,000 catheter days (a measure of the number of bloodstream infections compared to the time of exposure to catheters). About two-thirds of the 28 participating hospitals were able to reduce infections by an average of 57%, which Barbara Spreadbury, a vice president at CHCA, estimates saved 112 children's lives, and nearly \$1 million in potential treatment costs. The aim now is to test a more comprehensive set of measures over a longer period and get them adopted as standard procedure, according to Mary Gorman, a vice president overseeing the project at Nachri.

Children often have catheters and intravenous lines in place for longer than adults, in part because they require greater support from such interventions. Dressings at the insertion site can

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become loose or soiled, so it is important to maintain sterile conditions, such as frequent dressing changes and extra skin cleansing with powerful antiseptics. And staffers are encouraged to constantly assess whether a catheter needs to stay in place, removing it promptly if no longer vital to care. The measures in the prevention and maintenance bundles also require precautions not always taken for adults—such as using drapes that cover a child’s entire body to create the most sterile environment, and gowns, gloves and masks for doctors and nurses who insert catheters.

The new procedures, such as draping patients and donning full sterile gear can be time-consuming and frustrating. For example, at **Children’s Medical Center** of Dayton, Ohio, some staffers grumbled initially at new procedures that required monitors to halt catheter insertions if they see a possible contamination issue.

“When you are in the middle of a procedure and trying to find a site for a line, you may not realize that the catheter has touched the drape,” and restarting the whole process can be exasperating, says Hila Collins, a nurse specializing in infectious diseases at Dayton. But after participating in the CHCA pilot, the hospital dropped infection rates to zero very quickly and went 580 days without a

bloodstream infection. “Now if we get an infection, we treat it like a critical incident, asking whether we had a break in technique,” says Ms. Collins.

Arkansas Children’s Hospital, which is participating in the Nachri project, began an effort to reduce bloodstream infections in 1998, trying new methods such as catheters implanted with antibiotics to help fight infection, annual hand-washing campaigns and switching skin disinfectants. Though its infection rate has fluctuated over the years, it currently has fewer than three infections per 1,000 catheter days, a 60% drop from 1998 levels, in part because it is more consistently using all the steps shown to prevent infection.

“One of the things we’ve historically accepted is that a certain amount of infection is inevitable,” says Steven Schexnayder, chief of pediatric critical-care medicine at Arkansas. While infections may never be completely eliminated, “we’ve been able to demonstrate that we can make a serious dent.”

But getting hospital staff to consistently follow all of the steps is one of the biggest challenges, says Richard Brill, medical director of the pediatric intensive-care unit at **Cincinnati Children’s Hospital Medical Center**, and leader of the Nachri collaborative. To help make compliance easier, his hospital created a special

dressing-change kit that provides all the necessary equipment in a single package so staffers don’t have to hunt around for different bandages and gloves. The hospital also uses tiny mannequins to teach staffers how to drape babies, and encourages staffers to remind anyone, including doctors, who they see deviating from the rules.

Children’s Healthcare of Atlanta, which has two children’s hospitals with a total of 48 medical and surgical ICU beds, saw a sharp drop in bloodstream infections when it began requiring staffers to adhere to the evidence-based infection-prevention rules and displayed posters with “days since last bloodstream infection” prominently in staff areas. During the first six months of 2006, the rate of infections dropped to 1.2 per 1,000 catheter days, from 6.2 infections in the year before the initiative was started. That rate has bumped up slightly recently, leading the hospital to re-emphasize the importance of sticking to the program.

“The old mindset was that these are critically ill children and infections are going to happen,” says Dr. Stockwell, the pediatric critical-care specialist. “Now that’s changed to a mindset that says, ‘Let’s avoid anything that prolongs their hospitalization and makes them sicker.’ We have the means to do that now.”