Less risk to patients, shorter ICU stays

New Procedure Helps Hospital Fight Antibiotic Allergies

By Tyler Smith

Nearly 70 years ago, the U.S. prepared for the D-Day invasion by mass-producing millions of doses of an antibiotic called penicillin. The newly discovered ways to mass-produce the medication that could fight bacterial infections would prove so crucial to the war effort — in past conflicts, more people had died of infections than from direct fire — that it was soon dubbed “the miracle drug.” It remains an important part of health care’s antibiotic arsenal today.

But penicillin and other antibiotics can also pose a threat to patients who develop allergies to them. The antibiotics designed to protect or even save them can instead trigger serious reactions, including hives, hypotension, wheezing, swollen airways and even anaphylactic shock.

An antibiotic allergy doesn’t mean a patient can’t be treated with the drug, however.

Providers can safely “desensitize” patients to an antibiotic enough to allow them to use it. It is, however, a time-consuming process that requires painstaking attention to detail. Even a tiny miscalculation in a dose can put a patient in harm’s way.

Sensitivity training. But an effort of more than two years at UCH has produced a standardized procedure to desensitize patients to intravenous antibiotics. The protocol has simultaneously reduced the risk of medical error, saved time in the pharmacy and trimmed length of stay in intensive care units, where patients get the treatment.

“The process is also an example of good “antibiotic stewardship,” said UCH Pharmacy Clinical Coordinator Gerry Barber, RPh, MPH.

Done carefully, he said, the process allows clinicians to give patients the most effective antibiotic therapy instead of discarding it for fear of causing an allergic reaction.

“We’re not using second- or third-line regimens or alternative treatments,” he said.

Limiting the number of antibiotics and, especially, being able to use the most active infection-fighting agent, Barber added, reduces opportunities for bacteria to mutate into new antibiotic-resistant strains that could endanger the entire hospital population.

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Antibiotic desensitization itself is not new, said CU Professor of Clinical and Allergy Immunology Stephen Dreskin, MD, PhD, noting the procedure has been performed internationally for several decades. Dreskin himself has done it at UCH from the time he arrived in 1989.

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A little at a time. The process entails administering very small doses of the antibiotic to the patient intravenously.

If he or she tolerates a first, very low, dose, a nurse gives another, larger, amount, watching carefully each time for signs of allergic reaction. If there is no reaction, the process continues until the patient reaches the therapeutic dose.
The number of desensitizations was relatively rare – about one every three months, Dreskin estimated – until 2009, when the hospital began seeing more antibiotic allergy cases, many of them patients with cystic fibrosis (CF). These patients suffer from thick mucosal secretions in the lungs, pancreas and other organs that make them particularly vulnerable to infections that require frequent antibiotic treatment.

Given how dependent they are on antibiotics, CF patients are highly likely to develop an antibiotic allergy – about 30 percent, Dreskin said. If a patient exhibits an allergy to an antibiotic, providers often move to a different one, but treatment can become progressively more difficult as organisms develop resistance to the medications.

**What’s old is new.** That problem motivated providers to try desensitizing CF patients to drugs that they may not have taken since childhood, Dreskin said. Many of them did “quite well,” he added, but some of them required repeated desensitization procedures because the effect lasts only as long as the patient is taking the antibiotic.

Many of the repeat patients also responded well, Dreskin said, but the number of desensitization procedures increased to three or four a month, exposing inefficiencies in the way the hospital handled them.

For example, there was no standardized order set. The physician had to write out each dose – there might be as many as 15 – in the exact order, and pharmacists had to compound the doses from scratch each time.

The compounding step alone took pharmacists on average four hours, requiring the department to allocate “a significant amount of manpower,” said UCH Clinical Pharmacist Amy Go, PharmD.

Even more important, the lack of standardization significantly increased the risk of medication error.

“It was a pressing issue,” she said. “We were dealing with patients who could have an anaphylactic reaction,” Go said.

**Simpler is better.** The way orders had been written was “patient-specific and inconsistent and haphazard,” she explained. Physicians could write the wrong dose by misplacing a decimal point or using incorrect units; pharmacists could make a miscalculation in diluting the medication; nurses could administer the medication in the wrong order and give a patient a larger dose than he or she could tolerate.

As Barber put it, Go’s challenge was to “remove the inherent dangers of decimal points… These are minuscule amounts [of medication]. Even with a final, intended therapeutic dose of one gram, the dose-escalation leading up to this may start with as little a dose as 0.02 micrograms. The orders were very difficult for physicians to write, and there were dangers of a mix-up or a miscalculation error in compounding the drug.”

The old process was also inefficient. Because each order was different, pharmacists had to spend a great deal of time entering each one into the medical record and calculating dilutions.

As a pharmacy resident early in 2009, Go took on the task of formalizing the desensitization process and shepherding the new policy through various approval committees. She worked closely with Dreskin to identify the nine intravenous antibiotics that most commonly cause allergic reactions used for desensitizations and the standard doses nurses give needed to desensitize patients.

With Dreskin’s input, Go created a standardized order sheet – now part of the Epic electronic medical record – that spelled out the procedures to take place for any patient, including the precise amount of each dose, in the order it is to be administered. The orders also include medications nurses need to treat an allergic reaction if it occurs.

**Cookbook approach.** Go also standardized the drug-compounding task, turning it from a time-consuming, resource-intensive chore to a job akin to following a recipe. Pharmacists now simply follow standard dosing for each drug and instructions for dilution. A small study she led with Barber, Dreskin and former pharmacy practice resident Genevieve Kautz, PharmD, showed the standardization shaved more than three hours off the time required to get the doses ready.

The new approach frees up provider time in other ways. For example, physicians in some hospital groups, including lung transplant,
pulmonary, critical care and infectious diseases, can now prescribe desensitization treatment for patients who previously and successfully underwent the procedure for a specific drug. The Allergy/Immunology service must consult on new desensitizations but time spent on repeat desensitizations has been significantly reduced.

And the streamlined procedures help the hospital manage capacity. The old cumbersome process often meant an extra day in the hospital and sometimes in the ICU for patients, Dreskin said.

"In a best-case scenario, it was often 24 hours before we started desensitizing," he said.

The same study showed when providers followed the standardized protocol, the average length of an ICU stay fell by nearly a third, from 44 to 30 hours. The quicker turnaround is also a boon for quality care, Dreskin added.

"If we’re monitoring patient safety, the less time in the ICU and in the hospital, the better," he said.

The work Go began more than two years ago continues to bear fruit. She said she received lots of inquiries from fellow pharmacists after the standardization process and findings of the in-hospital study were presented at a national conference recently. She, Barber, Dreskin and Kautz have co-authored a manuscript of their study findings and have submitted it for publication.

The decision to keep working on a long-running, difficult project wasn’t hard, Go concluded.

“I wanted to keep doing it,” she said. “It’s an important thing for nurses, physicians and patients.”