A Complex Score With a Simple Outcome

University of Florida College of Pharmacy researchers hope a new scoring system will better allocate pharmacy resources to reduce adverse drug events in hospital patients.

By J. Michael Brown, Ph.D.

As the old saying goes, an ounce of prevention is worth a pound of cure. Imagine walking into work as a clinical hospital pharmacist and being handed a list of the top 10 percent of patients most likely to experience an adverse drug event (ADE) that day. What's more, it would be completely automated using the patient's electronic medical records (EMR), meaning even patients admitted the night before would appear on a list. Thanks to a grant from the American Society of Health-System Pharmacists Research and Education Foundation, Dr. Almut Winterstein, professor of pharmaceutical outcomes and policy at the UF College of Pharmacy, is working to make this the future of proactive management of preventable ADEs.

Preventable Problems

Asking 10 different pharmacists for their definition of an ADE will likely yield just as many answers. Winterstein prefers an expansive definition that classifies ADEs as either errors of omission or commission. Commission is the type of error many people think of when they consider an ADE. For example, a patient is recovering from surgery on a hospital floor and is being managed for pain when suddenly he or she is in respiratory depression due to opiate use. In contrast, an error of omission can occur when a prescriber is overly cautious in managing the pain of the same patient and the patient suffers in agony from under-treatment.

These two different types of ADEs are intimately linked and problematic when a healthcare provider is trying to ensure the best treatment possible for patients. Both present interesting challenges for the clinician, but can be prevented, and both are targeted by the new scoring system being developed by Winterstein's team of researchers. ADEs of all kinds are responsible for up to $5.6 billion in costs to the Unites States healthcare system, according to the Agency for Healthcare Research and Quality, which underscores the importance of the work being conducted by Winterstein. "Although some ADEs are unavoidable, a plurality should be known, and therefore prevented, through proper implementation of the scoring system currently being developed."

A Lifelong Journey

In many ways, Winterstein's current research is the culmination of a career built around identifying and mitigating preventable ADEs. She was educated in Germany for both her pharmacy and doctoral work during an exciting time in the expansion of pharmaceutical services to include more involvement in prevention of medication errors. When the opportunity arose to work with University of Florida professor Dr. Doug Hepler in 1999, she made the jump from Berlin to Gainesville, Fla., and has been with UF ever since. In 2001, she received her first grant from the ASHP Foundation to develop metrics to appropriately track medication error rates.

Winterstein's current work focuses on the information collected for the scoring system. The two-year, $499,000 grant represents the largest single grant ever awarded by the foundation. Her team is thinking big and involving a national advisory board of experts to look at every possible cause of an individual ADE. "This project is too large for one small group to properly accomplish," she said. "I have a great network of panelists who will help make this dream a reality."

Teamwork Plays a Role

The ambitious scope of the project has two main components the team is working to tackle. First, they are seeking to create algorithms for each of the ADEs observed. These algorithms will factor in every conceivable cause of the event and whether or not it would have been possible to prevent the event. Winterstein expects this to

consume much of the group's time over the first year of the project. Once they have a handle on the root causes of these errors, they can begin to develop the formula needed to plug into a patient's EMR to determine the likelihood of an adverse reaction in a given hospital population. Additionally, they hope to find many traits in the individual cases that do not merit tracking, thereby simplifying the final product.

The second aspect of the project is to design a system that will work with the variety of electronic health records used nationally. In order to reduce the variability in different hospital EMRs, the team is using several hospital systems with standardized EHRs for the initial design and testing of the scoring system. "We have a great network of hospitals that are committed to reallocating resources appropriately in order to make this successful," Winterstein explained. Adjusting the program to a national level will be the job of the ASHP Foundation, which will seek to develop the software into something useful to hospitals across the country.

Students working on the project are given individual adverse event cases and asked to look not only at pharmacotherapy, but also other possible causes of the injury. For instance, a patient may be on an oral hypoglycemic agent and experience hypoglycemia in the hospital. This could be the direct result of the drug, or perhaps the patient was getting a chest X-ray and missed lunch. Many times, data such as missing a meal can be harder to pull from the electronic records.

Long List, Short Outcome

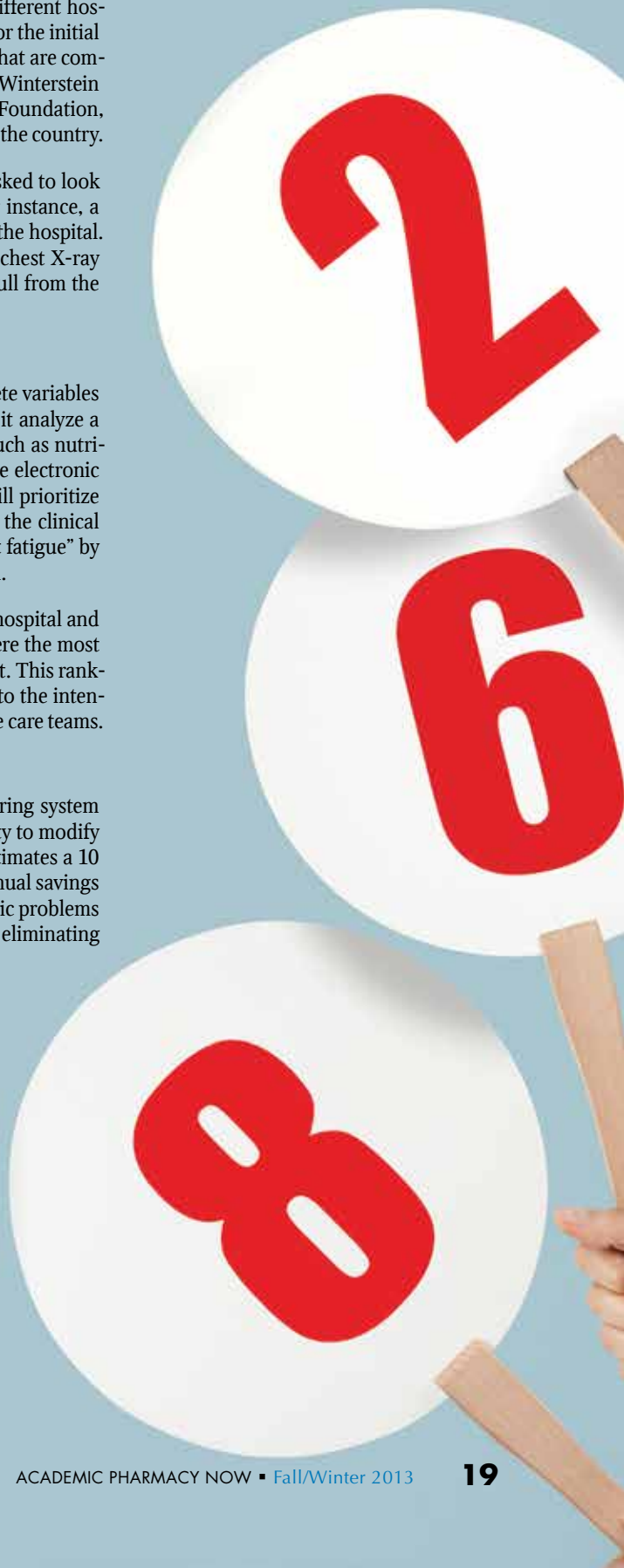
The final product will work during the early morning hours pulling all the discrete variables Winterstein's team develops to predict the likelihood of an ADE. Not only will it analyze a large number of medications and their known ADEs, but also factor in traits such as nutrition status, lab values and anything else that the team considers useful from the electronic records. The most unique aspect of the scoring system is the ranked list that will prioritize the likelihood of adverse events in patients. This eliminates the guesswork for the clinical pharmacist. Additionally, the list enables a pharmacist to avoid traditional "alert fatigue" by providing a concise record of those who most require the pharmacist's attention.

Winterstein sees this list as a tool to reallocate pharmacist resources within the hospital and eventually change the way pharmacy is practiced. Current models focus on where the most powerful or expensive drugs are used, such as oncology or the intensive care unit. This ranking list aims to enable pharmacists to prevent individuals from being admitted to the intensive care unit in the first place, and will drive more pharmacists into collaborative care teams.

A Shift in Thinking

The success of the new program will not only depend on the ability of the scoring system to correctly predict patients at highest risk for ADEs but also pharmacists' ability to modify therapy and avert errors. If this new program works as planned, Winterstein estimates a 10 to 20 percent reduction in risks, which could result in more than $1 billion in annual savings to the U.S. healthcare system. Additionally, the correction of potential therapeutic problems within the hospital will aid in transitional care upon discharge of the patient by eliminating possibly dangerous medications prior to discharge.

Winterstein acknowledges that this project will not accomplish everything on its own and stresses the need to educate the public on ADEs and quality of care. "There is a problem when it is easier to ascertain which hotel has the best service than it is to examine CMS ratings to determine where you should have your appendectomy." She also said that a cultural shift needs to occur within the healthcare system so that patients are educated about what to look for in their care, and one of those factors should be the rate of ADEs at different hospitals. Winterstein's scoring system can go a long way in making that goal a reality.



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