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Software Solutions

Hospitals tracking intervention data find huge cost avoidance, savings

Some use information to lobby for new PharmDs

Hospital systems traditionally have been unaware of the financial benefits of having clinical pharmacists providing care interventions. Everyone has agreed there are safety and quality improvement advantages to dedicating resources to clinical pharmacy salaries, but the cost savings were overlooked.

Well now new information technology (IT) advances make it far easier for hospitals to gather information and compare costs where medication interventions are concerned.

Pharmacists can collect data about patients' prescriptions, errors, adverse events, and interventions performed to prevent problems in a database that can analyze both aggregate and individual information.

The Bon Secours Health System uses Quantifi by Pharmacy OneSource to track these data across 14 hospitals, says **Carol Carson**, PharmD, BCPS, clinical pharmacy specialist at Bon Secours Maryview Medical Center in Portsmouth, VA. Carson also is the system administrator for Quantifi in 14 hospitals in six Eastern states.

Quantifi is a web-based management software tool that collects medication and pharmacy data and assigns dollar value to both actual cost savings and averted expenses. It is used by more than 800 hospitals in the United States.

Summary points

- One hospital system saved more than $2.2 million in 2008.
- Another hospital added two new pharmacist positions, justified by data.
- A third hospital system estimates a $500,000 monthly savings due to pharmacy interventions.

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The IT program tracked how the hospital system saved more than $2.2 million in 2008, most of which was cost avoidance savings, Carson says.

"We did 34,066 interventions for 2008 and logged 6,634 hours of pharmacist time," she adds.

The top medication interventions by volume were vancomycin, warfarin, TPN or PPN, levofloxacin, pantoprazole, enoxaparin, piperacillin and tazobactam sodium, moxifloxacin, gentamicin, and lansoprazole. **(See chart of aggregate pharmacy clinical interventions data, p. 112.)**

The program can track medication management and other data in a variety of ways, depending on what a hospital system wants to track.

For example, the Bon Secours Health System collects data by intervention type, showing a dollar amount that is saved per intervention and how much time the intervention takes, Carson says.

So the long list of interventions for any month might include these types of notes:

- CHEMOTHERAPY: order clarified OR dose changed;
- CHEMOTHERAPY: double check;
- CHEMOTHERAPY: drug held due to labs;
- CLARIFICATION: bad handwriting;
- CLARIFICATION: drug-dose-frequency-duration;
- DOSING/MONITORING: anticoagulants;
- DOSING/MONITORING: Aminoglycosides.

It would be impractical, maybe impossible, for pharmacists to track every intervention they do, Carson notes.

"If they were to document everything they do they'd have to keep a scribe with them all day," she says.

So pharmacists make certain they document all interventions that help improve safety or that pertain to specific hospital programs, such as antimicrobial stewardship, Carson adds. **(See story about hospital systems' antimicrobial stewardship program, p. 118.)**

"They know I read every single intervention relating to safety, so they're sure to get that in," she says.

Aggregate analyses can include financial data that can be used to justify clinical pharmacy resources and to market for additional resources. **(See story about how financial data are calculated, p. 113.)**

Hospital pharmacy directors need hard data to show why clinical pharmacy services are financially essential, as well as important for safety and quality control purposes, experts say.

St. John Medical Center in Tulsa, OK, began using Quantifi four years ago, and within one year the pharmacy department had justified adding two more positions, says **Mark Mills**, PharmD, BCPS, clinical coordinator of St. John Medical Center.

"We took those numbers to our administration and said, 'If we had two, more FTEs we could produce this much more,'" Mills recalls.

One of the new positions was for a clinical pharmacist-surgery, who would help improve antibiotic prophylaxis management in surgery.

The hospital already had a clinical pharmacist who assisted with critical care patients in the intensive care unit, Mills says.

The hospital has about 100 surgeries per day, and its data suggested there were a significant number of cases in which antibiotics were continued after 72 hours, when they should have been discontinued, he explains.

So pharmacy leaders made the case that the

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new clinical pharmacist in surgery would prevent inappropriate use of antibiotics and have both actual cost savings and cost avoidance savings.

"We've definitely justified that position," Mills says. "What's nice about [the software program] is you can make your own interventions and label them."

New York Hospital Queens in Flushing, NY, uses Quantifi and Pharmacy OneSource's new Sentri7 systems to track and target specific medications and problem areas, says **Alex Melchert**, MS, RPh, director of pharmacy at New York Hospital Queens in Flushing, NY.

"We're finding that the majority of errors we're seeing include narcotics, analgesics, including morphine," Melchert says.

So the hospital has established changes that help reduce these errors, he adds. **(See story on opioids intervention, p. 114.)**

"We've looked at the information in various ways to see if we have a problem with a particular service," Melchert says. "We look at particular floors, individual drugs, and drug classes."

The electronic medication management system made it easy to comply with the Joint Commission's national patient safety goals regarding anticoagulation programs, he adds.

Electronic management and tracking systems also save time and money.

Melchert has calculated the hospital saves 80 clinical pharmacist hours per week through use of the electronic medication management system.

All of these benefits are important marketing points when pharmacy directors speak with hospital leaders about increasing or justifying clinical pharmacy resources.

"The profession of pharmacy has always given away their cognitive services for free, and they don't have methods to bill for cognitive services," says **Charles Westergard**, BsPharm, MBA, vice president of clinical affairs of Pharmacy OneSource Inc. of Bellevue, WA. Westergard is a co-founder of Pharmacy OneSource, which was begun in 2000 with Quantifi as its flagship product.

So in the traditional hospital, the pharmacist's cognitive services were undervalued.

Westergard recalls a moment when this reality hit home at a hospital in which he was a staff pharmacist: "We installed a Pyxis, automatic dispensing machine, and pharmacists were not involved in the process which moved distribution away from pharmacists to technicians," Westergard says.

"One day our chief operating officer came down and said, 'Hey, it's great you're getting all these drugs to the patient, and we love the machines, but what are your pharmacists doing now?'" he says. "That was a tough question to answer because all we could say was 'We're doing really great stuff,' and that wasn't good enough for him."

The chief operating officer wanted the pharmacy to justify the clinical programs that were in place, and the pharmacy couldn't do it because they weren't documenting how they made a difference in the hospital, Westergard adds.

"A lot of pharmacies face that problem around the country, and that's what led me to document what we do and assign a value to it," he says.

The Greenville Hospital System in Greenville, SC, began to use Quantifi several years ago with the main objective of capturing workload statistics and productivity of staff pharmacists, as well as the cost savings associated with pharmacists' activities, says **Lynn Ethridge**, PharmD, manager of pharmacy informatics at the Greenville Hospital System, which has about 1,100 beds, five campuses, and roughly 50 pharmacists.

Hospital leaders and pharmacy managers initially were surprised by the early data: "We were overwhelmed by how much our pharmacists were doing," Ethridge says.

"We didn't have any idea of how many medication errors were being prevented and how much work pharmacists were actually doing," she adds. "We were blown away with the data."

The software made it easier for the hospital to start warfarin monitoring as part of a national patient safety goal. **(See story on the best ways to use electronic medication management programs, p. 115.)**

"We had warfarin anyway as an intervention, but when we tracked and trended what we were doing before it became mandatory in January, the numbers went through the roof," Ethridge says. "We wanted to show the administration what the staff is doing from a productivity standpoint."

And it gets administrators' attention when they're shown hard dollar savings, she adds.

"On average, we're saving the institution roughly more than $500,000 a month," Ethridge says. "So the administration likes to see that."

When pharmacists make certain patients receive the correct dose of a drug, there are potential overdoses that are avoided and there's a savings from reduced frequency of medication

administration, she explains.

"We count all that as cost savings because the pharmacy tends to get [more accurate] drug levels than prescribers do, and that overall saves the institution money and improves patient outcomes, reducing length of stay," Ethridge says.

Bon Secours Maryview has an anticoagulation monitoring service in which pharmacists catch errors, such as drugs dosed incorrectly for the patient's weight, Carson says.

Much to Carson's surprise, patient weights ended up being a top intervention according to the electronic management system data.

"I was really surprised to see the top intervention we had throughout the system was the lack of proper weight evaluation on patients," Carson says.

The problem involved unit secretaries entering patient information and not always having an accurate patient weight, she explains.

If a patient were to be prescribed medication based on that incorrect weight, there could be an adverse event. The interventions occurred when pharmacists checked the orders and patients' weights and saw a problem that could be averted by having nurses weigh the patient and obtain the proper numbers, Carson says.

"We estimated we saved $250,000 just on that one intervention in cost avoidance savings," Carson says. "These included interventions in which the pharmacist clarified the weight before dosing and found it was wrong, or when the weight wasn't listed and the pharmacist obtained it." ■

Pharmacy Clinical Interventions Update — Q2 2009

Pharmacy OneSource of Bellevue, WA, has shared this quarterly report of the top clinical interventions, drugs associated with medication errors, and drugs associated with adverse drug reactions (ADRs) among the more than 800 hospitals using its Quantifi medication management and tracking tool.

For the second quarter of 2009, Quantifi had 44,035 users documenting interventions, medication errors, and ADRs, and they recorded more than $126 million in cost savings.

Users documented 2,134,854 interventions in the second quarter, and these were associated with $13,389,190 actual savings and $112,851,479 in risk avoidance savings by pharmacists through intervention. Real reduction in supply costs (such as a switch from atorvastatin to simvistatin) is an example of actual dollar savings; avoided potential costs (an adverse drug event or an extended length of stay) represent risk avoidance savings.

Here are the top drugs associated with a documented intervention, medication error, or adverse drug reaction recorded in Quantifi in the second quarter of 2009, and the total number of reports for each for that same quarter:

Top Drugs Associated with Clinical Interventions
Vancomycin: 63,910
Warfarin: 58,506
Enoxaparin: 40,508
Levofloxacin: 22,444
Piperacillin and tazobactam sodium: 15,374
Heparin: 15,169
Pantoprazole: 14,237
Total parenteral nutrition (TPN): 11,465
Gentamicin: 8,215
Famotidine: 7,968
Insulin preparations: 7,803
Ciprofloxacin: 7,025

Top Drugs Associated with Medication Errors
Insulin preparations: 422
Vancomycin: 399
Enoxaparin: 394
Morphine Sulfate: 344
Warfarin: 315
Heparin: 288
Potassium chloride: 238
Levofloxacin: 211
Acetaminophen: 194
Piperacillin and tazobactam sodium: 165
Ceftriaxone: 157
IV fluids: 53

Top Drugs Associated with Adverse Drug Reactions
Warfarin: 1,706
Morphine sulfate: 564
Insulin preparations: 518
Hydromorphone: 416
Vancomycin: 355
Levofloxacin: 210
Fentanyl: 204
Lisinopril: 195
Methylprednisolone: 193
Heparin: 191
Digoxin: 167
Ciprofloxacin: 124

For more information about the report and electronic medication management and tracking system, visit the web site: www.pharmacyonesource.com/applications/quantifi.

Software's financial calculations give power to pharmacy staffing requests

Here's how the dollar amounts are calculated

One key to any electronic documentation tracking system is that it employs numbers that are meaningful to those using the program.

But in the world of hospital pharmacy there have been few recognized strategies for calculating the financial cost of medication errors.

"When we set up our company we realized there were no good standards for how pharmacists were justifying the value of their clinical services," says **Charles Westergard**, BsPharm, MBA, vice president of clinical affairs of Pharmacy OneSource Inc. of Bellevue, WA. Pharmacy OneSource was begun in 2000 with the medication management system called Quantifi.

"So I put together a spreadsheet that defines a model for how to assign cost avoidance numbers to a pharmacist intervention," Westergard says. "It's broken into three pages, and each has soft and hard cost savings where appropriate."

Pharmacy OneSource defined soft savings as those where if an avoidance of an error had been allowed to proceed then the hospital would have incurred additional costs, he explains.

"This is where a pharmacist steps in and says, 'I prevented this allergic reaction; the patient was allergic to this drug, and if I hadn't done this intervention, the hospital would have incurred additional costs,'" he adds.

The hard savings are where the hospital saves real dollars because of an intervention, such as a change in an antibiotic drug prescription, Westergard says.

Summary points

- Electronic medication management system has model for assigning cost avoidance numbers to a pharmacy intervention.
- Costs are in 1999 dollars and adjusted for a 4.5% inflation rate.
- Program calculates 2.6% of adverse events will incur costs.

Pharmacy OneSource obtained its basic cost estimates from medical literature of the financial costs of medication errors, published in the late 1990s, Westergard says.

"The numbers are pretty clear," he says. "The articles say when you boil down all the numbers here it turns out that every preventable adverse event (AE) has a cost."

The costs were in 1999 dollars, so the Quantifi program adjusts them for inflation, using a conservative inflation rate of 4.5%, Westergard adds.

"We went on to say that not every single preventable error will incur that cost," he says. "The primary literature says a certain percentage, about 3-7% of all AEs will go on to incur those costs."

Quantifi uses 2.6% to be very conservative, he adds.

What that means is that in every 38 patient interventions, one will incur the adverse drug event (ADE) cost. So if the cost is $8,500 per ADE, then it is divided by 38 to show what the cost avoidance number is for every intervention conducted, Westergard says.

"This applies to where an action of a pharmacist prevents an error, whether it's preventing an allergy or drug therapy consultation," he says. "All of these interventions are avoiding some mistake, and that's why we can use this cost model to apply to that."

There are a small number of interventions in which a dollar value cannot be assigned, Westergard notes.

"For example, when a pharmacist hands out poison control information, we don't put a cost number to that," he says. ■

New electronic system improves efficiency in pharmacist reviews

Problem medications quickly pop up

While it's important to have a good medication management tracking tool, the data collected isn't useful unless it's used to improve patient safety and outcomes, experts say.

"You can't just collect numbers," says **Alex Melchert**, MS, RPh, director of pharmacy at New York Hospital Queens in Flushing, NY.

"You have to be able to look at numbers and see where you can make some sort of improvement," Melchert says.

Summary points

- Electronic management/tracking tool needs more than just numbers.
- Tool shows patients' individual medication use data and highlights in red print where a lab value is out of range for a particular drug.
- The clinical pharmacist team looks at evidenced-based data and modifies the electronic program based on new standards and data.

For instance, Melchert uses medication management data collected through Pharmacy OneSource's Quantifi program to focus on high-alert medications, meet standards by the Joint Commission of Oakbrook Terrace, IL, and to report to the hospital's pharmacy and therapeutics committee and medical board.

Also, Quantifi works in conjunction with Pharmacy OneSource's latest electronic medication management system called Sentri7, which brings data to the individual level.

Sentri7 provides pharmacists with a dashboard that helps to break down data to the patient level so they can identify which patients to target for interventions, says **Charles Westergard**, BsPharm, MBA, vice president of clinical affairs of Pharmacy OneSource Inc. of Bellevue, WA.

For example, Sentri7 will show patients' individual medication use data and highlight in red print where a lab value is out of range for a particular drug, he says.

Then in small print it lists a suggested action for what the pharmacist should do when it sees this red flag.

While the 170 hospitals using Sentri7 have basically the same clinical categories, each might have some differences in their intervention programs, and the software enables them to adjust the rules according to their own standards.

"We leave it up to clinicians to build out the logical rules that pertain to patients," Westergard says.

At New York Hospital Queens, Sentri7 helps pharmacists save time by narrowing down the medication profiles they need to review, Melchert says.

"The usual routine is that clinical pharmacists come in and look at areas for which they're responsible, print out profiles, and find areas for improvement," he explains. "But they'll have to look at a lot of information they don't need because not every patient needs an intervention."

With the detailed data mining capability of an electronic medication management program, pharmacists can decide to look at all patients taking warfarin who have a lab value for INR greater than 2.5, Melchert says.

"The program will ignore everyone who has a lower lab value than that," he says. "It allows you to fine tune the process and saves you from looking at patients who are stabilized."

A pharmacist could decide to check all patients with impaired renal function who have been prescribed a particular drug that might impact renal function, and initiate an intervention this way, he adds.

"You tell the program what you want it to look for, and you define your terms," Melchert says. "It could look at only certain high-risk populations of elderly individuals with impaired renal function who are on an antibiotic that impairs their renal function."

The clinical pharmacist team looks at evidenced-based data and modifies the electronic program based on new standards and data.

"We had a recent modification about having a more aggressive approach to glucose monitoring because of recommendations from the American Diabetic Association and the American Medical Association," Melchert says.

"The program is limitless; it can look at lab work or anything, and you just need the proper training to find it," he says. "It allows my staff to look at far more patients in the high-risk drug population categories than we would ordinarily be able to do." ■

Prevent opioid medication errors using instant electronic warnings

Program built into CPOE

New York Hospital Queens in Flushing, NY, adopted an electronic order entry system around the same time it implemented an electronic medication management and tracking program.

Together, the electronic systems have made it fast and easy to track prescriptions and prevent potential problems in real time.

"We have a completely electronic ordering process for medications," says **Alex Melchert**, MS, RPh, director of pharmacy.

The information obtained through the medication management system can be put into the computerized physician order entry (CPOE) system along with instant warnings, he explains.

For instance, dosage ranges for opioids are in the system and will create warnings when a prescription is made for outside the range.

"We also look at drug interactions, and if we see a potential problem with a particular population, we can put in a warning screen about it," Melchert says.

"Every dose is checked individually anyway," he explains. "But if we can get it to the doctor before they write the order and actually use it as part of their thinking process then we've succeeded in changing the process."

These electronic communications serve to educate physicians at the point of order entry, Melchert says.

"So when a physician orders a product, a warning will come up and say, 'There's a potential look-alike, sound-alike medication here, are you sure this is what you really want?'" Melchert says.

A clinical pharmacist with a background in informatics creates the warning messages, which are then put into the system by an information technology specialist.

"We're lucky to have a pharmacist with a background in informatics because this is something pharmacy schools are not addressing well," Melchert says. "This is where we have to go in the industry."

Increasing numbers of hospital pharmacies are using computerization or robotics, so hospitals need to have people who know how to take that information and manipulate it, he adds.

"A new system may solve some errors, but create others, so you have to be on top of that," he says.

The CPOE system also can serve as a useful educational tool, Melchert notes.

"I use it to let people know I have a drug shortage and this is what their alternative is," he says. "The number of phone calls it saves us is phenomenal."

Physicians now ask the pharmacy department about adjusting the CPOE system to improve their workflow.

"We try to use the system in a way to reduce the number of phone calls needed and to put out information and to restrict drugs," Melchert says.

"Prescribing some drugs requires a level of confidence that the average resident hasn't developed," he explains. "So they may pick a medication because they're not sure what they really want, but then a message will come up that says they need approval for that choice." ■

Summary points

- Having integrated electronic management, tracking, and physician order entry tools can make it easy to communicate warnings and other information to providers.
- A clinical pharmacist who has expertise in informatics creates the warning messages, and an IT specialist incorporates them in the electronic tool.
- System reduces the number of phone calls pharmacists need to make to physicians.

Experts offer these tips on how to get the most out of electronic program

Optimize medication management

Hospital system pharmacies can improve how they use electronic medication management and tracking programs by following expert advice.

For example, some nonprofit hospitals might track information that will assist them in keeping their tax-exempt status.

"We track our hours of teaching, and every time we have an interaction with a surgical resident, we submit it to our administration," says **Mark Mills**, PharmD, BCPS, clinical coordinator of St. John Medical Center.

Or hospitals might use the data for research purposes.

"We're in the early stage of a collaboration with Clemson University researchers," says **Lynn Ethridge**, PharmD, manager of pharmacy informatics at the Greenville Hospital System of Greenville, SC.

"Anytime we need to call a physician to have a drug, dose, or interval adjusted, we call that a near-miss event," Ethridge says. "So we're start-

Summary points

- Pharmacists should use electronic medication management and tracking system to target specific interventions.
- Electronic database can be used to provide staff feed-back and positive reinforcement.
- Hospital system tracks unapproved abbreviations, using tool.

ing to look at that information as a means to measure near-misses medical events."

Mills and Ethridge offer these suggestions for other ways to maximize data and value from an electronic medical management and tracking system:

• **Give feedback to staff:** "We present information to staff at staff meetings to let them know how we're doing as a department and to give them a sense of ownership," Ethridge says.

"We show that we're not just plugging in numbers to the database every day, but we're actually using them for a good purpose," she adds. "We want to show our administration that we're doing things above and beyond entering orders in a computer."

The pharmacists' extra work in capturing the interventions and other data will help justify their jobs and their salaries, Ethridge says. "Pharmacists are not cheap."

The medical management and tracking data illustrate how hard pharmacists are working, and it's important to let the pharmacy staff hear kudos.

"We show our staff what a great job they're doing because in the grind of everyday work they don't always get that feedback," Ethridge says. "We show them how this is great, and we give them a pat on the back."

When the Greenville Hospital System's pharmacists first learned how many interventions they were logging in each month, they were surprised, Ethridge recalls.

"We'd never measured that part of their jobs before," she says. "We were able to capture when they entered orders and new starts, but we couldn't show them how they made this number of interventions in a month."

Now managers can tell pharmacists how many times they positively impacted patient care and lowered length of stay, she adds.

• **Use electronic program to target specific interventions:** "We have pharmacists who target specific interventions, such as fall prevention, renal dosing," Mills says. "They enter those interventions into the electronic program and track them."

The pharmacists are assigned specific duties, such as targeting patients who are receiving a particular medication, he says.

"They evaluate those patients and document the outcomes in the program," Mills says. "Pharmacists also do renal dosing and evaluate patients who might be on medications that cause them to be at high risk for falls."

It's fairly simple to create new fields for intervention tracking and to eliminate fields that are no longer necessary, he adds.

"For a while we tracked the pneumococcal flu vaccine," Mills explains. "Then that number stabilized and the hospital was doing well on that measure, so we're just not documenting it any more."

The data still are being collected, so if it ever becomes a problem again, it can again become a field that's pulled out and reviewed, he adds.

• **Lobby for more staff, showing medication management data:** "We've added more staff to the clinical department based on the information," Ethridge says.

As the Greenville Hospital System adds services, such as an ambulatory care clinic and a vascular service to improve outcomes, then pharmacists are hired to support those patients and physicians, she explains.

"We've added an anticoagulation pharmacist position and are actively seeking to fill that position," Ethridge says. "We anticipate increasing our risk avoidance savings in that area."

• **Pull reports that compare data:** "There's a global report that we run every month, and it tallies everything," Mills says.

For instance, the global report provides these tallies:

- total number of interventions;
- adverse event reactions;
- trends;
- number of interventions per day; and
- total cost savings per day.

Mills can click on a pharmacist's name and see how many interventions he or she has reported.

"That's a good way to get an idea of what's going on with each individual pharmacist," he says.

"You can also create your own report on how many IV to POs you have," Mills says.

Also, Mills knows from the database that there were around 2,500 interventions in a recent month, and pharmacists have a high acceptance rate of 96% from prescribers.

"It helps having pharmacists on those teams," Mills notes. "We build rapport with prescribers, and they feel comfortable with us, so when we make suggestions they accept them."

• **Track unapproved abbreviations:** The Joint Commission of Oakbrook Terrace, IL, has a strict stance against unapproved abbreviations, Ethridge says.

"We use the program to capture both unapproved abbreviations and prescribers who use them so we can send information back to the medical staff that grants privileges to prescribers," Ethridge says.

For example, prescribers often abbreviate morphine sulfate as MS4 or MS. But these abbreviations also could be confused with magnesium sulfate, so they're supposed to spell it out to avoid having someone dispense the wrong medication, she explains.

"Doctors being extremely busy individuals tend to abbreviate, and it's a habit we have to get them out of for patient safety," Ethridge says.

Also, physicians are supposed to spell out the terms "four times daily" and "once daily," instead of using the abbreviations QID and QD, she adds.

"We put a laminated copy of the Do Not Use Abbreviations in every patient chart, and we put educational posters in nursing stations and lounges," Ethridge says. "We sent out notices to physicians and put it on the main GHS web site, and we published it in our medical staff newsletter."

Anytime a physician wrote a prescription with an unapproved abbreviation, pharmacy staff called the physician to let him or her know that it was an unapproved abbreviation, Ethridge says.

"We asked them to rewrite the order to an approved method of order logging," she adds. "Then we printed monthly reports per prescriber, sending them information and supporting data from the Joint Commission, about how they did."

Since focusing on this intervention through the medication management program, the hospital system has greatly decreased its use of unapproved abbreviations, she says. ■

Professional Pharmacy Focus: Antimicrobial Stewardship

Hospital's medication management/tracking tool helps antibiotic program

Precise vancomycin use is tracked

Bon Secours Maryview Medical Center of Portsmouth, VA, uses an electronic medication management tool to track all interventions involving vancomycin use, as part of an antimicrobial stewardship program.

"We track interventions in antimicrobial stewardship," says **Carol Carson**, PharmD, BCPS, clinical pharmacy specialist at Bon Secours Maryview. Carson also is the system administrator for the medication management tool Quantifi for 14 hospitals across six states for the Bon Secours Health System.

"We know we have a strong vancomycin dosing service," Carson says. "But we want to make sure pharmacists get the proper literature on how to dose vancomycin, including the new paper out from the Infectious Diseases Society of America (IDSA)."

For example, when a sister hospital saw the latest IDSA paper, pharmacists realized their target levels for vancomycin weren't high enough, and so they upped the levels, Carson explains.

Pharmacists dose nearly all vancomycin orders at Maryview, Carson says.

"And if we don't dose it, then the medical staff has given pharmacists the authority to monitor it and order labs if the physician doesn't order them," she adds. "Pharmacists can intervene

Summary points

- Revise and adjust antibiotic recommendations based on new research, literature.
- Hospital found that 53% of antimicrobial use was appropriate.
- Physicians and pharmacists were partners in developing prospective audit and feedback system to prescribers.

if we need to, especially if a physician hasn't done a dose level according to our policy."

The health system's electronic medication monitoring system has made it possible to calculate that when an intervention involves the sepsis drug drotrecogin alfa (Xigris®), the savings is $13,000 per intervention if the drug is not used.

"Some hospitals find it very hard to rein in those Xigris costs because of indiscriminate use," Carson notes. "But at Bon Secours Maryview, any physician who writes an order for Xigris will have the pharmacy review his work to see if the patient is an appropriate candidate."

If the patient doesn't meet criteria for the expensive drug's use, then the patient is not given the drug and the case is documented as an intervention with cost savings, she adds.

The antimicrobial stewardship program was started in January 2009 and after four months of data were available, the information was analyzed and submitted as an abstract for presentation at the 2009 American Society of Health System Pharmacists Mid-Year Meeting, Carson says.

The data indicated that about 53% of the hospital's antimicrobial use was appropriate, Carson says.

"We found that fluoroquinolones were misused, and then we found inappropriate antibiotic use in patients with respiratory illnesses who had no signs or symptoms of infection," she adds. "We found failure to order multiple sets of diagnostic blood cultures, and that's very important."

The latter finding led to an educational intervention when it was discovered that physicians thought they were ordering two sets of blood cultures, but were actually only ordering one on the computer, Carson explains.

"So we educated the physicians on how to order it correctly," she says.

The antimicrobial stewardship program consists of pharmacists assisting an infectious diseases physician who has a part-time position at the hospital.

"We partnered physicians and pharmacists in processes using automated technology in developing a prospective audit and feedback system to prescribers," Carson says. "The ID specialist writes up a communication, and then we look at those communications to see how they were handled by prescribers."

The infectious diseases doctor determines whether the antimicrobial use was appropriate, and pharmacists relay this information to attending physicians, says **John Austin**, PharmD, a clinical pharmacist at Bon Secours Maryview.

"These communications are placed on the chart for the physician to review," Austin says. "On occasion there might be one that's urgent and needs immediate response, and in those cases I call the physician right away."

"We monitor to see if that particular suggestion has been addressed by the attending physician," he says.

The recommendations typically are printed out and put in the chart where they remain in the chart and become a permanent part of the chart, Carson says. ■

Improve the efficiency of your antimicrobial stewardship program

Follow these guidelines

Hospital and pharmacy leaders will be focusing more attention on antimicrobial stewardship in 2010 as this area is expected to receive increased regulatory scrutiny.

Many hospitals have antimicrobial stewardship programs in place. But one question hospital pharmacists should be asking themselves is "How efficient and effective is my program?"

For instance, one approach to antimicrobial stewardship is for a hospital pharmacist to conduct a prospective audit, reviewing patients' antimicrobial medications to see what they are being prescribed, what the doses are, their body weight, and other demographics and restrict the medications choices, says **Robert C. Owens**, Jr., PharmD, co-director of the antimicrobial stewardship program at Maine Medical Center in Portland, ME.

The other approach is a back-end model in which a pharmacist reviews what has already been

Summary points

- Review reports for low-hanging fruit to improve efficiency.
- Pharmacists need to make antimicrobial stewardship a top priority for hospitals.
- Make recommendations to physicians in notes, which serve as education too.

prescribed and makes recommendations for changes when appropriate.

At Maine Medical Center, an infectious diseases pharmacist, an ID pharmacy resident, and an ID physician review patients receiving antimicrobials for suggestions to improve use, Owens says.

"Do we get to all the patients today?" he says. "No, we try to make it efficient."

One way they improve efficiency is through reviewing reports for the low-hanging fruit, he says.

"We make dosing adjustments based on patients' body weight," Owens explains.

For instance, a typical example is the 40-year-old, 160-kilogram man who has uncontrolled diabetes and a diabetic foot infection and who surely needs more vancomycin than the 1 g every 12 hours prescribed to him. Or, the 50-kilogram woman who is 91 years old requires less than 1 g of vancomycin every 12 hours. Still, physicians often will prescribe the same dosages, regardless of the patient's body weight, and pharmacists can catch these errors and correct them, Owens says.

"One gram of vancomycin is what everyone prescribes, regardless of age and body weight," he adds. "A 23-year-old will clear vancomycin like the wind and may require 1.5 g every eight hours, instead of the traditional dosage."

So the low-hanging fruit are cases in which the dosage does not correspond with the patient's weight and age.

"We're working on sending out alerts where if someone has a trough value out of range, then we'll get those reports back to make sure nobody falls through the cracks," Owens says.

It often is up to pharmacists to make antimicrobial stewardship a priority because as hospitals' patient populations increasingly are sicker, older, and more complicated medically, physicians move antibiotic-related issues down the priority list, he notes.

"Physicians logically address the top concerns of the day and move on," Owens says. "My job is to make certain that antibiotics are in the top 3, and if not, then I can help them with antimicrobial stewardship."

Owens works with an infectious diseases physician and an infectious diseases pharmacy resident, who recently have become part of the stewardship program.

"So now we have a team of three, and we'll be able to become more efficient," Owens says. "We divide and conquer: We each take a handful of reports, go through those reports, and identify perhaps 20 patients who need to be seen and others we can easily help."

When the antimicrobial stewardship team gives feedback to physicians, they use a nonconfrontational style, often leaving notes that identify the patients who need an intervention, he says.

More than two-thirds of the recommendations are made in notes, and nearly a third is made through phone calls or face-to-face interactions, Owens says.

"We have a two-part carbonless form we leave in the chart as a recommendation, and we explain in the recommendation why we suggest this and give them an educational vignette," Owens says. "This doesn't step on toes as much as a restrictive program, where you have to go through an individual to get the antibiotic you want."

Also, the notes, written on 1.5-inch long sheets of yellow paper are not kept as a permanent part of the medical record, he adds.

So this gives Owens the freedom to get physicians' attention with wording that might say, "This regimen will increase the likelihood of mortality by 50%."

Pharmacists follow-up on those notes with an immediate phone call, and the form is left as a reminder to those who follow, including other medical/surgical teams that might be following the patient, Owens says.

He'll include references to studies on the topic.

"They are often appreciative of that," Owens says. "It's so significant that you leave a note behind for educational purposes and that the note gets pulled at discharge, so it's not kept in the medical record or in the progress notes."

This retrospective method works well in a

COMING IN FUTURE MONTHS

- Hospital system has technician intervention program to identify errors
- Geriatric pharmacist targets fall prevention
- Use descriptive research in developing medication use evaluation program
- Begin new antimicrobial stewardship program
- Learn Joint Commission guidelines for antimicrobial stewardship

hospital that mainly has community physicians, he adds.

The restrictive method will create interpersonal problems and ultimately lead to long-term problems, he says.

"It creates adversarial relationships in many cases," Owens says. "Restrictive methods work because physicians will use the nonrestrictive drugs more often because they don't have to go through a gatekeeper, but sometimes the nonrestrictive drug might be the inappropriate one."

The model employed at Maine Medical Center is one that has potential to lead to better outcomes over the long-run, he adds.

When there is a medication problem that requires immediate attention, the pharmacist will contact the prescriber immediately and explain why the prescription needs to be changed, Owens says.

The passive notes method also works to educate physicians about excess durations of therapy, and those interventions often get a call too.

For example, if a patient has ventilator-associated pneumonia and has been receiving antibiotics for too long, the note might say, "Day 11 of 8 for ventilator-associated pneumonia," Owens says. "The doctor might come by and say, 'I should have stopped on day 8.'"

So that's a subtle way to get the message out to not only the prescriber, but to others on the medical team, he adds.

"If you don't leave the note the therapy might be changed, but the education is lost between you, me, the prescriber, and the 12 other people following the patient," Owens says.

Because of this intervention, the hospital has one of the lowest antibiotic utilization rates for a hospital of its size, Owens notes.

One more key to an effective and efficient antimicrobial stewardship program is continuing education even when it seems that everyone gets it.

"What I've learned is you can do this hard and heavy for seven months and then interventions go down for several months," Owens says. "But at the end of those three months, it magically goes back up, and you're doing 20, 30 interventions a day again."

Pharmacists can educate about antimicrobial stewardship, but they can't stop the education.

"If prescribers don't continue to hear something, they'll go back to what they were taught," Owens says. ■