Taking aim at overuse: daily labs, high-cost send-outs

William Check, PhD

April 2014—As reimbursement models change, achieving better test utilization William Check, PhD April 2014—As reimbursement models change, achieving better test utilization will become a survival strategy. And in the hard work to imp will become a survival strategy. And in the hard work to improve test use, the computerized physician order-entry system appears to be the work tool with the winning record.

Inpatient laboratory tests at Massachusetts General Hospital fell by 21 percent between 2002 and 2007, despite a seven percent increase in the number of discharges. Per discharge, inpatient tests dropped by 26 percent (Kim JY, et al. *Am J Clin Pathol*. 2011;135:108–118). Kent B. Lewandrowski, MD, associate chief of pathology and director of laboratory and molecular medicine at MGH and professor of pathology at Harvard Medical School, calls the number of inpatient tests per discharge "a global benchmark," saying, "It rolls up all of our individual utilization initiatives."

'"Variability in a process is almost always a sign of waste," says Anand Dighe, MD, PhD

Financial incentives in health care in the U.S. have tended to be poorly aligned with quality outcomes and, for outpatient testing in particular, encourage overuse, says Anand Dighe, MD, PhD, associate pathologist and director of the core laboratory at MGH and associate professor of pathology, Harvard Medical School. "In the pure outpatient fee-for-service environment we've been operating in for the last couple of decades, we got paid well for outpatient laboratory tests. We've encountered few [payer] rejections and not had to confront bundled payment until recently. Now," he says, "more contracts are paying for the total cost of patient care over a year or more and bundling all aspects of inpatient and outpatient care." No longer will the hospital be paid $50 for a comprehensive metabolic panel, for example. "That expense will come from the overall patient bill." Further, payers are increasingly scrutinizing payments for molecular testing such that "now, especially when done in a reference lab, molecular testing really hits the bottom line."

In anticipation of reimbursement changes, Drs. Dighe and Lewandrowski and their colleagues have been working to optimize test ordering. In one project to curb test ordering in the surgical intensive care unit, they used several interventions. One was lectures to SICU personnel on the recommended use of tests, which Dr. Lewandrowski calls a weak intervention. Stronger interventions were creating guidelines for lab test ordering, auditing providers and giving feedback to the SICU director, requiring physician orders for all tests and holding nurses responsible, and banning daily recurring (QD) orders for most tests.

The laboratory has seen a sustained 30 percent reduction in the volume of test orders from the SICU, starting in the first month in which the project was implemented, Dr. Lewandrowski says, emphasizing that it was a team effort. Several of the steps depended on the hospital's computerized provider order-entry system, or CPOE.

Use of the CPOE catalyzed another utilization program, the Bigelow Rational Lab Test Ordering Project, begun in May 2008 and designed to reduce ordering of QD laboratory tests. Physicians were in the habit of putting in QD "until discontinued" orders for complete blood count, electrolytes, glucose, calcium, and other analytes. In addition to being wasteful, daily labs are thought to be a major contributor to hospital-acquired anemia.

"Bigelow is a classic teaching service and largely run by residents," Dr. Dighe explains. Three teams on Bigelow, known as the intervention group, were not allowed to order recurring labs. They were told to anticipate tomorrow's labs in each day's progress note. Control teams followed usual ordering procedures. Using the prior October to April as a comparison period, ordering of QD CBCs by the intervention group in May was only about five percent of the baseline level, compared with 50 percent in the control group. QD electrolytes also dropped substantially.

Physicians actually favored the more stringent ordering system: 85 percent said the intervention improved or had a neutral effect on care, and 64 percent said the intervention should be instituted as standard protocol. Nurses, too, were in favor. One commented, "So many patients actually got to sleep for more than two hours at a time."

"Think outside the lab: Consider other utilization impacted by laboratory testing," says Kent Lewandrowski, MD.

In November 2012, Dr. Dighe and his colleagues went one step further. They created a functional specification for the CPOE that would restrict QD ordering and got approval from the physician order entry committee. In February of last year they met with internists and hospitalists, and in April they went live. Now all daily lab orders require a reason and are monitored. Inputting a QD order triggers a pop-up. One message: "Daily labs are not indicated in

most cases…. All daily labs will be monitored."

The result: a sharp drop in non-template daily orders. Moreover, thanks to this single intervention, the overall volume of testing has declined by about five percent. "We have seen a sustained reduction that has not gone back up," Dr. Dighe says.

They have since added another intervention: e-mails to those using what appear to be inappropriate orders. Rules behind the scene trigger the message, which begins: "You are receiving this e-mail because during the past week you placed four or more orders for recurrent daily labs without an apparent approved indication." Messages are sent weekly to frequent offenders. Dr. Dighe describes this intervention as "relatively mild," but says, "It does seem to work."

"In this situation we made it inconvenient to order daily labs," he says. "We can make it impossible. In the new provider order-entry system we can eliminate that choice. We'll probably do a target intervention in July with the new residents. That will ratchet up the pressure quite a bit." Is it easier to make changes with residents than with others? "Just the opposite," Dr. Dighe says. "Residents are incredibly busy. By ordering lab tests daily times four or five they shortcut the system. When we deal with the professional staff or hospitalists, they rarely put in anything but orders for the next day."

The CPOE is central to all of these activities. It's a "key leverage point to improve ordering practices, prevent ordering errors, and avoid preanalytic error," Dr. Dighe says. Not long ago it was estimated that only 12 percent of U.S. hospitals used CPOE. "It has since increased," he notes, adding that he's seen it quoted as high as 70 percent. "For the EMR, we may now be at 50 percent," he says, due to the incentive of stage two meaningful use dollars.

"Pathology should have control over the content of all laboratory order-entry modules," Dr. Dighe insists, and such control begins whenever a new system is implemented. Partners Healthcare, of which MGH is a member, is currently implementing a new $1 billion EMR system, and initially there was no pathology representation on several key EMR committees. "We thought that this was a gross oversight," Dr. Dighe says. "So many decisions are based on lab tests. We argued that pathology needs to be at the table."

For pathology to make its case, he says, "you have to talk with one voice." In a large system such as the one in which MGH operates, which consists of six main and other hospitals, speaking with one voice can be difficult. "We came together very early," Dr. Dighe says. "The two pathology chairs at Brigham and Women's and MGH argued to the EMR executive committee that they needed to add pathologists to the various teams." Pathology's request was granted in part, he says, because "we had a good track record of contributing to our homegrown order-entry systems."

Of course, CPOE is only one of the first steps in the laboratory testing process. Ordering, collection, processing/analysis, interpretation, and reporting can all be managed and enhanced through informatics. Dr. Dighe, who has informatics training, and his colleagues built a middleware program for the MGH laboratories that connects the hospital clinical information systems to the LIS and facilitates information flow about testing services (Grisson R, et al. *Am J Clin Pathol.* 2010;133:260–289).

How many laboratories can afford to have a trained informaticist on staff? Perhaps more than think they can. "I was not hired as an informatics person," Dr. Dighe says. "I was hired as an assistant chemist. I still do a lot of chemistry and hematology and am director of the core lab. Pathology departments are looking for people who can do both informatics and laboratory medicine. There's just so much data crunching and so many ways we need to rely on computerizing now." More than 10 pathology residency programs have established an informatics track in the past decade, according to Dr. Dighe.

To take advantage of the opportunities informatics offers, Dr. Lewandrowski advises, "Think outside the lab: Consider other utilization impacted by laboratory testing." An interdepartmental project at MGH entailed prospective auditing of carbepenem prescribing, with intervention and feedback. Antimicrobial costs at MGH had risen by 15 percent in two years—from $6.5 million in 2009 to $7.45 million in 2011. Carbepenems were one

important factor—they cost $60 to $70 per day, compared with $17 for a cheaper alternative, cefepime. “Our prior method to control expensive antibiotics was to require approval from infectious disease,” Dr. Lewandrowski says. “But then there was no way to turn it off.”

For the intervention, patient history and microbiology data are reviewed to determine whether a carbepenem is appropriate. If not, the laboratory sends an e-mail to the ordering physician and care team, saying, in part: “Recent culture and antimicrobial susceptibility data from your patient reveal that the organism(s) is/are susceptible to other, nonrestricted antibiotics.” A report is included and alternative agents are identified.

From 2010 to 2011, the number of daily doses of carbepenem dropped by 12 percent, despite an increase in the number of isolates carrying extended-spectrum beta-lactamases. Commensurate financial savings were realized. “This benefit has extended and achieved additional savings,” Dr. Lewandrowski says.

To find other opportunities for utilization improvement and cost savings, Dr. Lewandrowski suggests continually reviewing the reference lab budget. Over time a high-cost, low-volume test often increases in volume and can be adapted to existing lab platforms, at which point it can be brought in-house. Hepatitis C virus genotyping and free light chain assays are examples.

With genetic tests, however, insourcing opportunities are limited, largely because of rapid growth in the use of these assays, especially in oncology, and the speed with which new mutations are discovered. And many genetic tests are proprietary. “Ordering of genetic tests, including molecular microbiology and medical genetics, is exploding,” Dr. Lewandrowski says. “Even if you don’t order them often, one $5,000 test per month can produce a big annual bill. Very few hospital laboratories will be able to insource a significant number of these tests.”

One approach is to ban certain tests. At MGH this route was taken with a bladder tumor marker, NPM-22, a send-out test on which MGH was spending almost $100,000 per year. It was an add-on test that did not change the approach to patient care. A conversation with the chief of the specialty service led to the ban. “He didn’t realize it was costing that much,” Dr. Lewandrowski says.

“We are receiving many more rejections for high-cost molecular testing,” Dr. Dighe says. “Whole exome sequencing now costs $5,000 at many of the reference labs. However, genetic tests are getting less expensive and more comprehensive. There’s hope around the corner.”

In the meantime, laboratories must figure out how to manage high-cost send-out molecular tests. Between 2002 and 2008, the expense of genetic tests sent to reference laboratories rose by 26 percent per year at MGH, compared with 6.5 percent for nongenetic tests. As a proportion of reference laboratory expenditures, genetic testing rose from just over 10 percent to almost 40 percent during this period.

When looked at by provider, ordering of genetic testing varied considerably, from $550,000 for the top ordering provider (a pediatric geneticist) of the 25 examined, to less than $50,000 for each of the lowest 15 ordering providers. Three other pediatric geneticists were among the top five ordering providers, along with one neurologist. Interestingly, two pediatric geneticists were among the lowest ordering providers. “Variability in a process is almost always a sign of waste,” Dr. Dighe says.

To address this issue, the pathologists used a multipronged approach including the development of practice standards and reporting of reference laboratory utilization to providers (“report cards”).

After the entire system was reviewed with providers and the chief of service, the laboratory began to monitor weekly reference laboratory expenditures by pediatric geneticists. In the first year in which the program was operative, total genetic testing costs declined for the first time on record. Dr. Dighe estimates that more than $500,000 of the directly avoided cost was attributable to the practice guidelines. “This project would not have succeeded without highly detailed, real-time data” that the laboratory’s information system provided, he says.

Overall this reduction in reference laboratory test ordering has been sustained, Dr. Dighe says. “However, the budget has picked up. It feels like we are working on this every day. The dynamic nature of this field means it requires constant attention.” A new director was hired for the core laboratory, “with a 20 percent time

commitment to be responsible for the reference lab budget," he says.

Holding down expenditures for genetic send-out tests is a challenge that knows no geographical boundaries. At the University of Washington, a group of laboratorians, geneticists, and pediatricians took on the same Herculean task (Dickerson JA, et al. *Arch Pathol Lab Med.* 2014;138[1]: 110–113), an effort reported in CAP TODAY ("How labs are taming test utilization," June 2013).

Dr. Harbour

At Bon Secours Richmond (Va.) Health System, John R. Harbour, MD, a member of the Department of Pathology and medical director of the laboratory at Bon Secours St. Mary's Hospital, also took up the gauntlet of genetic testing costs. "Several years ago we saw an increasing number of infrequent tests going to various reference laboratories," says Dr. Harbour, regional medical director, HealthPartners Laboratories, and president, Monument Pathologists.
"We started thinking about it," he says. "Cost was going up, and we were trying to ensure that testing was medically appropriate for the acute care of the patient." He began to review tests that were low volume/high cost and could not be ordered by name in the EMR. Since the tests were ordered as miscellaneous tests, Dr. Harbour asked laboratory staff to bring him these requests along with information about the patients. "I reviewed the charts," Dr. Harbour says. "Clearly some were indicated. If they were not indicated, I spoke to the ordering physician. Basically I said, 'Educate me. You are the subject matter expert. Why are you ordering this test and/or requesting referral to this particular lab? If our contracted reference lab could do the test, would that be acceptable?'"

Over time Dr. Harbour's reviews became more of what he calls stewardship about rising cost and declining reimbursement. Some testing was not necessary for acute care or for short-term post-discharge care. "These tests do not get back for some weeks. They don't help us modify acute care," he says. Bringing them in-house was not an option: "Many genetic tests are so infrequent you would be hard-pressed to find resources or expertise to set them up yourself or validate them."

In one situation, a pediatric geneticist consulted on a newborn with facial characteristics that could be one of several syndromes. The most likely one was relatively benign, but another possibility was more severe, with short- and long-term medical implications. When Dr. Harbour spoke with this doctor, she said it needed to be done and it made sense to do it pre-discharge. The child was going to be discharged that day, but since there would be near-term followup, the test was performed.

At the opposite end of the spectrum, Dr. Harbour cites a group of genetic abnormalities related to febrile seizures in children. "If it is genetic you might intervene sooner," Dr. Harbour says. "But most kids are treated symptomatically. You may not need to know the genetic makeup unless seizures are uncontrolled or the presentation appears to be at the more severe end of the spectrum." Of the samples sent from his laboratory for this test, most have come back negative or inconclusive. This raises the question as to clinical utility—are the correct patients being tested or is the evidence not sufficiently clear to determine which patients need testing?

In another case, a clinician requested an esoteric test that cost $11,000. Once Dr. Harbour discussed the clinical setting, the value the test would add in providing care, and finally the cost, the clinician withdrew the request.

For the past few years Dr. Harbour has reviewed requests for esoteric reference tests on an ad hoc basis, using cost to the laboratory of more than $1,000 as a trigger for review. In his decisions he emphasizes clinical

relevance, determined in consultation with clinicians. “Not all pathologists are comfortable evaluating requests and obtaining additional information or justification from the ordering physician,” Dr. Harbour acknowledges, especially if the clinician seems challenging. “A clinician’s diagnostic knowledge or acumen could come across that way,” he says. “Some clinicians say, ‘That’s what I want. Just do it.’” With these doctors it doesn’t pay to argue, Dr. Harbour says. “You take what you can get and move on.” Fewer physicians these days take that attitude. “Physicians are becoming more appreciative of having a pathologist take an interest in their patient,” he says. “They recognize we bring value and improve patient care.”

Dr. Harbour’s individual efforts are becoming more structured with the formation at his hospital of a standing committee composed of subject matter experts. “This activity is evolving for us from a lab-centric process to a more formal laboratory and clinician interaction process. It requires collaborative discussions between a pathologist, clinician, and a geneticist, each with their own perspective and expertise,” he says. His key message: “Don’t try to do it yourself unless you are a molecular pathologist or a geneticist. It’s too complex.”

The trigger point may be lowered, perhaps to $500. “Our process has been effective,” he explains, “but some tests don’t get ordered singly.” His chief example is microbiology, where PCR-based tests for bacteria, viruses, and fungi may be ordered as a group. Each may cost $500, thus in aggregate exceeding the $1,000 review criterion.

As Bon Secours’ pediatric presence in the community has grown, so too has the urgency around these esoteric genetic tests. “There is no independent children’s hospital in Richmond, so we are seeing more pediatric need for testing. That’s changing our focus. Instead of asking, ‘Do we need to do this test because it will change acute care?’ we are asking, ‘Do we need to do it now for genetic counseling about long-term consequences?’ That raises difficult ethical questions. In the pediatric genetics world, now that we have the whole genome sequenced, we are seeing many new associations between a genetic defect and a particular syndrome, a trend that will only accelerate.” Dr. Harbour’s questions: How long to wait before facilitating new testing, and how tight must the association be before testing becomes routine?

Having seen how two institutions addressed esoteric genetic tests, one in a computerized way, the other with a more personal approach, let’s return to MGH for one final utilization campaign, a demonstration of how advanced informatics can help reduce errors in a common measurement, serum glucose. Errors in routine laboratory practice can come from many sources, but up to 70 percent of diagnostic errors have a preanalytic source, Dr. Dighe says, such as draw errors.

To determine which specimen results are spurious and which are true, he and his colleagues employed a branch of artificial intelligence called supervised machine learning, or SML. A well-characterized “training” data set is generated from elevated glucose values that are classified as real or spurious by retrospective record review. The training set then teaches the computer to create a decision tree through a technique called recursive partitioning. Pathology knowledge supplied to the computer in building the decision tree included sodium, potassium, chloride, bicarbonate, and other values. The program determined, for instance, that glucose greater than 800 mg/dL with a normal anion gap is usually spurious.

When the algorithm was implemented, it performed prospectively on real patients with 74 percent sensitivity and 100 percent specificity, compared with only nine percent sensitivity for technologist judgment. “If you give a computer enough data, it will find signals in the analytes to look at,” Dr. Dighe says. Supervised machine learning has been a powerful technique for them. “We are also using it to look at thyroid test results. We concentrate on results that seem implausible, which can suggest assay interference.”

While you might expect that the many successes in utilization at MGH would engender nothing but optimism, Dr. Dighe’s motto is “Expect and embrace failure—then do something about it.” It’s a good way to stave off frustration and retain sanity while on the grueling path to a critical goal.

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