Utilization Management in a Large Urban Academic Medical Center

A 10-Year Experience

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Key Words: Utilization management; Cost containment; Intervention; Laboratory test; Blood components

Abstract

Management of laboratory test utilization presents an ongoing challenge. Most studies reported in the literature have described efforts to control one or a few tests, but the results cannot be generalized to a broader utilization management strategy. Herein we report our experiences with an organizational utilization management program during a 10-year period. Cumulatively, our program has achieved significant success, saving millions of dollars in blood components and reducing inpatient tests per discharge by 26%. Highlights from our experiences include the importance of implementing an institutional organizational structure to support utilization management, the central role fulfilled by clinical pathologists as leaders of the program, the ability to obtain timely utilization data, and careful selection of the most appropriate implementation tools tailored to the unique circumstances of each utilization management initiative.

National health spending in the United States as a percentage of the gross domestic product (GDP) has outpaced growth in the overall economy since 1965 to the present, with the current recession expected to increase this gap. In the next decade, projected spending in health care is estimated to reach $4.4 trillion, or 20.3% of the GDP in 2018, from $2.2 billion and 16.2% of GDP in 2007. Concerns about costs, quality of care, and patient safety continue to drive efforts to improve utilization of health care services, including in the laboratory.

Physicians are estimated to control up to 80% of health care costs, and more than half of their decisions are believed to be influenced by laboratory data. In one large medical center that tracks information flow, about 94% of requests to the electronic medical record were for laboratory results. However, research suggests there can be wide variation in test ordering behavior for similar clinical syndromes, with no apparent correlation between volume of laboratory testing and clinical outcomes or quality of care. Another persistent finding in the literature has been that usage practices for medical procedures, tests, and hospital use differ by region and geography. Such inexplicable variation suggests that, at some level, there is excess use and waste of medical resources.

Clinicians face an ethical conundrum, described by Hiatt from an adaptation of Hardin’s “The Tragedy of the Commons,” whereby maximizing use of resources for every patient runs the risk of eroding the overall health care system. In a response to the physicians’ conflicting responsibilities for the “medical commons,” it has been argued that reductions in unnecessary care would make available sufficient resources for beneficial, even expensive, care.
Inappropriate laboratory utilization is widely believed to contribute to escalating health care costs. Existing incentive structures are said to promote overuse of laboratory tests and include pressure from patients, the practice of “defensive medicine,” and current financial reimbursement schedules. Apart from cost considerations, unnecessary laboratory testing has adverse clinical implications. With about 5% of the healthy population falling outside the “2 standard deviation” limits for most reference intervals, every test introduces the risk for an elevated or low result, which may lead to further testing and labeling of healthy patients as diseased.

A variety of proposals to improve laboratory test utilization have been published, including a number from our institution. Many interventions have been met by critiques of their approaches, not the least of which is the failure to adequately define what is meant by “appropriate utilization.” Although they differ by their proposed solutions, almost all studies on interventions have focused on decreasing utilization of one or a few tests. In addition, cost savings from utilization interventions are not distributed equally across all tests. For example, achieving a 10% decrease in use of high-volume automated testing yields a disproportionately smaller 1.32% decrease in total expenses, because only marginal costs are saved in a high-fixed-cost operation.

Given that implementation of any intervention is associated with costs in time and resources, it is important to set priorities for interventions having the greatest impact financially, clinically, and operationally. Deciding where to focus utilization improvement efforts requires a decision-making infrastructure at the organizational, rather than departmental, level. Such a programmatic approach to utilization management has been mostly neglected in the literature. In this report, we describe a framework for developing an ongoing institution-wide laboratory utilization management program. We also describe the central role of clinical pathologists in providing leadership for the utilization management program.

Materials and Methods

Setting

The Massachusetts General Hospital (MGH) is an 898-bed tertiary care academic medical center in Boston, MA. The MGH Clinical Laboratories in the Department of Pathology support all of the inpatient medical, surgical, pediatric, and obstetric services of the hospital, as well as extensive primary care and specialty outpatient practices extending into the greater Boston community. The clinical laboratories include the core laboratory (chemistry-hematology), microbiology, blood transfusion services (BTS), and various specialty laboratories (immunology, diabetes, and affiliated health center laboratories).

Surveillance of Laboratory Use

We collect detailed information each time a physician orders a laboratory test or performs a free-text search from our computerized provider order entry (CPOE) portal. Details of the order are captured and are available for review. In addition, there is a search box in the CPOE portal that allows users to search the laboratory catalog for available tests. For every search performed, the stored data elements include the date and time of activity, search text (what the user typed in), the number of search results retrieved, and a unique session identifier. A free-text box is also available for users to “write-in” laboratory tests, and these data are also recorded.

Regular electronic reports allow our clinical pathologists to review ordering patterns for the entire institution and by clinical service and location. Provider-specific reports and audits of individual tests can also be obtained.

Results

Organizational Structure

The organizational structure for utilization management at the MGH is outlined in Figure 1. The major governing committee in the hospital is the General Executive Committee (GEC), whose membership includes clinical chiefs of service and senior hospital administration. The chief of pathology serves on the GEC. The Medical Policy Committee (MPC) reports to the GEC and is responsible for establishing policies and standards for clinical activities in the hospital, including utilization management. Its membership includes the chief medical officer, various prominent clinicians, and representatives from nursing and other departments. The Clinical Laboratory Advisory Committee (CLAC) was established.
as a subcommittee of the MPC for the purpose of reviewing and approving laboratory-related issues, including utilization initiatives. Membership of the CLAC includes representatives from pathology who chair the committee and a cross-section of physicians from different clinical specialties. Agenda items that are approved by the CLAC are forwarded to the chief medical officer for final approval.

The Clinical Practice Management Committee (CPM) was a parallel committee structure in the hospital that was dissolved in 2008 and replaced with a new organizational structure. The CPM was chaired by the associate chief medical officer. Its membership consisted of clinical and administrative representatives from all hospital services (eg, physicians, nursing, pharmacy, and laboratory). The purpose of the CPM was to provide an organizational structure for interdepartmental teams working on clinical service improvements. Specific interdepartmental project teams were formed to address laboratory-related issues such as developing a critical values reporting structure and selected laboratory utilization initiatives. These teams reported to the CPM. Pathologists chaired the laboratory interdepartmental teams and were regular members of CPM.

The BTS uses the hospital Transfusion Committee for some of its utilization-related initiatives. The Transfusion Committee includes representatives from the BTS and various clinical services.

An important point is that the major committees are interdisciplinary, allowing for broad institutional representation during the monitoring, review, and approval processes of utilization initiatives. A second point is that the senior administration and physician leadership in the hospital are involved in the utilization management process (via the GEC and MPC), adding legitimacy and authority to the program. Finally, clinical pathologists are integrally involved in all committees regarding laboratory utilization, often serving in leadership roles.

Most initiatives for improving utilization of laboratory services are initiated by clinical laboratory directors in our department and are submitted for presentation to the CLAC. Approval of initiatives is accomplished by a blinded ballot. In most cases, unanimous approval is required. Following approval from the CLAC, the proposal is submitted to the hospital MPC, chaired by the chief medical officer of the hospital. Implementation is then carried out by departmental or interdepartmental teams, as appropriate. Frequently, hospital information systems personnel are involved in implementation of changes that require the CPOE system.

### Utilization Initiatives in the BTS

Examples of utilization management initiatives in the BTS are outlined in Table 1. Conceptually, we divide blood products and components into 2 categories: high-volume with low-unit-cost components (eg, RBCs, platelets, and fresh frozen plasma) and low-volume with high-unit-cost products (eg, intravenous immunoglobulin [IVIgG] and recombinant factor VIIa). The strategy for managing these 2 classes of components is different.

For the high-volume with low-unit-cost components, we use a retrospective computerized review using a customized program to verify that patients who received a transfusion met established hospital criteria for appropriateness to receive the component, as shown in Table 2. These transfusion criteria were developed and approved by the hospital Transfusion Committee and are posted on the computer screen used by physicians at the time of requesting blood components. The computer program flags cases in which a patient received a transfusion but did not meet standard transfusion criteria. The flagged cases are then reviewed by a director in the BTS, and an e-mail message is sent to the ordering physician describing details of the case and reiterating the transfusion criteria. The e-mail message includes a link to a departmental Web site that

**Table 1**
Examples of Blood Bank Utilization Management Interventions at the Massachusetts General Hospital, Boston, Resulting in an Estimated Cost Savings/Avoidance of ~$1.735 Million Annually

<table>
<thead>
<tr>
<th>Product, Clinical Setting</th>
<th>Type of Utilization Problem</th>
<th>Intervention</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVIgG for patients after bone marrow transplantation and with other conditions, eg, TEN</td>
<td>Guidance for appropriate use of high-unit-cost product</td>
<td>Policy to restrict routine use in bone marrow transplant recipients to patients with hypogammaglobulinemia; elimination of routine use of IVIgG in treatment for TEN</td>
<td>Restrained use of IVIgG per hospital guidelines; ~$500,000 annually</td>
</tr>
<tr>
<td>Off-label use of recombinant factor VIIa</td>
<td>Non-evidenced-based use of high-cost product</td>
<td>Added consultant-gatekeeper (transfusion medicine physician)</td>
<td>Reduced off-label use by 10-fold compared with comparable institution; estimated cost-avoidance of $400,000 annually</td>
</tr>
<tr>
<td>Universal leukoreduction of blood components</td>
<td>Non-evidenced-based use of technology applied to high-volume blood component</td>
<td>Prospective randomized controlled trial to obtain appropriate evidence</td>
<td>Savings of ~$50 per RBC and pooled platelet transfusion; cost avoidance of ~$835,000 annually</td>
</tr>
</tbody>
</table>

IVIgG, intravenous IgG; TEN, toxic epidermal necrolysis.

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Table 2
Blood Component Utilization Guidelines at the Massachusetts General Hospital, Boston, as of 2010

Transfusion care should be individualized to the needs of each patient. Packed RBCs should be considered for:
1. Hematocrit <21% (0.21) in the absence of cardiovascular disease
2. Among stressed patients for the prevention of ischemia:
   - Age <40 y, hematocrit <24% (0.24)
   - Age 40-60 y, hematocrit <27% (0.27)
   - Age 60-70 y, hematocrit <30% (0.30)
Platelets should be considered for:
1. Prophylaxis against spontaneous bleeding for adults with platelet count <10 × 10³/μL (100 × 10⁹/L)
2. Bedside invasive procedure and platelet count <30 × 10³/μL (30 × 10⁹/L)
3. Bleeding intraoperatively or postoperatively and platelet count <50 × 10³/μL (50 × 10⁹/L)
4. Bleeding after cardiopulmonary bypass and platelet count <100 × 10³/μL (100 × 10⁹/L)
Do not transfuse platelets in the setting of HIT and TTP. Platelets may not be useful in ITP, PTP, DIC, or uremia.
FFP should be considered for:
1. Bleeding in patients with INR ≥ 2
2. Bedside invasive procedure and INR ≥ 2
3. Prophylaxis (nonbleeding) with INR ≥ 2
FFP is not indicated for patients with INR < 1.5.

DIC, disseminated intravascular coagulation; FFP, fresh frozen plasma; HIT, heparin-induced thrombocytopenia; INR, international normalized ratio; ITP, idiopathic thrombocytopenic purpura; PTP, posttransfusion purpura; TTP, thrombotic thrombocytopenic purpura.

provides brief synopses of key publications on the clinical use of blood components.

The strategy behind this process is not only to provide clinicians with information on the latest clinical trials relevant to the decision to transfuse but also to open a dialogue via email between the requesting clinician and a representative of the hospital transfusion service. This interaction in the context of a recent transfusion decision is particularly valuable for new residents who join the hospital on an annual basis. Although we do not have specific data to document the impact of this intervention on appropriate blood usage, we believe the effort contributes to reducing unnecessary transfusions by providing ongoing individualized education to physicians and house staff.

In the case of low-volume with high-unit-cost products, we use a consultant-gatekeeper approach. Requests for specific high-cost products are discussed with the requesting physician and must be approved by a director in the BTS before they will be released. This approach requires 24-hour coverage by a senior physician in transfusion medicine. This approach is used for several products, including IVIgG and recombinant factor VIIa.

In the case of IVIgG, the Transfusion Committee developed evidence-based guidelines for use of IVIgG in hematologic, neurologic, immunodeficiency, dermatologic, and infectious disease disorders.36 These guidelines restricted the routine use of IVIgG in bone marrow transplant recipients to recipients with an IgG concentration less than 400 mg/dL (4 g/L) and eliminated the routine use of IVIgG in patients with toxic epidermal necrolysis. The combined annual savings on IVIgG accumulated to about $500,000. Guidelines were also developed for restriction of off-label use of recombinant factor VIIa. Estimated annual savings on recombinant factor VIIa were approximately $400,000. This estimate is based on comparison of our utilization of recombinant factor VIIa with that of a similar academic medical center in our area with an equivalent patient case mix but in which preapproval by a laboratory director is not required. Collectively, the savings to our institution from the aforementioned utilization initiatives is approximately $900,000 per year, not including potential savings attributed to the continuous educational effort on high-volume and low-unit-cost components.

A third example of our involvement in transfusion medicine concerns an evidence-based evaluation of the appropriateness of leukoreduction applied to all blood components, a policy that was being considered by the US Food and Drug Administration (FDA). In our institution, the use of universal leukoreduction would have added $835,000 to our annual budget for RBCs and platelets. To address the value of such an approach, our blood transfusion service conducted and published the results of the largest prospective, randomized, controlled clinical trial on the benefit of universal vs selective leukoreduction.37 The study demonstrated no benefit from universal leukoreduction, and this finding substantially contributed to the decision by the FDA to discontinue further consideration of mandatory universal leukoreduction. We continue to offer leukoreduction only in selected cases with evidence-based indications.

Utilization Initiatives in the Clinical Laboratories

The clinical laboratories offer a wide variety of in-house and reference laboratory send-out tests. In a typical year, as many as 1,400 different tests are requested. We have developed metrics to track the success of individual utilization initiatives and the success of the program as a whole. The metrics we use vary but include tracking numbers of specific tests, tracking the test volume on specific services, and tracking the total number of tests per inpatient discharge. Selecting a metric to evaluate the success of a utilization effort may be straightforward in the case of individual tests or may be complex when the metric is intended to evaluate the overall success of the utilization management program. The metric we have selected to assess our overall success is the number of tests performed per inpatient hospital discharge. Table 3 summarizes the global impact of utilization initiatives as measured by the number of inpatient tests per discharge from 2002 through 2007. Data after 2007 are not shown because of significant changes in how we track test volume owing to the incorporation of chemistry panels on inpatient units in the hospital.
Overall, there was a 26% decrease in the average number of tests per patient discharge during a 6-year period. This result reflects the cumulative impact of numerous individual utilization initiatives over time. Selected examples of specific utilization initiatives are outlined in the following sections. These examples are not comprehensive, but rather, were chosen to illustrate different techniques used in our utilization management program.

Use of Provider Order Entry

Our hospital uses an electronic order entry system on the inpatient units. The order entry system provides a number of opportunities to manage inpatient test ordering. One feature of the order entry system is a “quick-pick” screen that conveniently displays the commonly ordered laboratory tests. Each test has an electronic check box that can be selected from the menu. We have selectively removed tests from the quick-pick screen that we determined to be overused or obsolete. One example is lactate dehydrogenase (LDH). LDH may be abnormal in a number of conditions, but in most cases, other tests such as creatine kinase or transaminases provide similar and more specific information, and the additional order for LDH is redundant. Removal of LDH from the quick-pick screen resulted in an approximate 50% reduction in inpatient test requests. Similarly, removal of creatine kinase (CPK) resulted in a 48% decrease in inpatient test requests.

Another example of the use of the order entry system is the use of “pop-up” reminders that appear when certain tests are selected. For example, when a physician requests “daily routine labs” (e.g., calcium/phosphorus/magnesium, basic metabolic panel, or CBC), a pop-up reminder appears describing the limited value of performing routine daily laboratory testing in the majority of hospitalized patients. Requests for daily labs beyond 2 days in the order entry system are automatically rejected. Review of current testing patterns for each service will guide the selection of which tests to eliminate. Several examples of the elimination of duplicate orders are illustrated.

A final example of the use of order entry concerns test ordering for vitamin D. In most situations, the appropriate test to assess vitamin D status is 25-hydroxyvitamin D (as opposed to 1,25-dihydroxyvitamin D). If a physician requests 1,25-dihydroxyvitamin D, a pop-up reminder appears to explain that the most appropriate test of vitamin D status is usually 25-hydroxyvitamin D. Implementing this pop-up reminder resulted in a 71% reduction in 1,25-dihydroxyvitamin D orders. In virtually every case in which the 1,25-dihydroxyvitamin D was not ordered, the user took the advice and ordered the more appropriate 25-hydroxyvitamin D test. This example highlights an important point concerning utilization management. Specifically, the order entry system can be especially useful when 2 or more similar tests are available and clinicians are confused about which one is the correct test for a specific clinical indication.

Use of Admission Templates

Our institution uses a number of admission templates for routine and specialized clinical conditions. Examples include a heart failure template and a rule out acute myocardial infarction (RO-AMI) template. The templates are developed by multidisciplinary teams and specify standardized physician orders, medications, and laboratory tests. All tests on the templates are reviewed by a clinical pathologist. In 1 example, we collaborated with cardiology to develop the RO-AMI template. Before the template was implemented, test orders for RO-AMI varied depending on the admitting physician. Typically, physicians requested serial testing for troponin T, creatine kinase MB isoenzyme (CK-MB), and total CPK. Duplicate orders were common, especially when patients were transferred from the emergency department (ED) to inpatient units. Many patients received 4 or more serial cardiac marker panels, when only 3 are required. The template specifies a standard RO-AMI laboratory protocol consisting of troponin T, CK-MB, and CPK on admission, followed by troponin T at 2 time points thereafter. Following implementation of the template, aggregate test volumes for cardiac markers declined dramatically, as shown in Figure 2. Of note, the volume of troponin T tests also declined, possibly owing to standardization of the serial marker testing protocol. In the near future, CPK and CK-MB will be eliminated from the template.

Service-Specific Initiatives

Different clinical services have varying needs for laboratory support. Review of current testing patterns for each service...
Clinical Chemistry / Original Article

The SICU, we developed a set of test ordering guidelines, as working with nursing management and physician leaders of expedite the care of patients newly admitted to the SICU. By laboratory testing without a physician’s order in an effort to types of tests. In a number of cases, nurses would request 23,000 test orders per month. Most of these were for routine our surgical intensive care unit (SICU) averaged approximately may present opportunities to improve utilization. For example, our surgical intensive care unit (SICU) averaged approximately 23,000 test orders per month. Most of these were for routine types of tests. In a number of cases, nurses would request laboratory testing without a physician’s order in an effort to expedite the care of patients newly admitted to the SICU. By working with nursing management and physician leaders of the SICU, we developed a set of test ordering guidelines, as summarized in Table 4. These guidelines included a mandate that all test requests require a physician order. In urgent cases, the nurse could obtain testing without an order but would be required to inform the physician and obtain a request after the emergency had passed. Following education of the SICU staff, we implemented the guidelines. The result, as previously reported, was a 37% decrease in testing volume with no apparent impact on clinical care.

Another example of a service-specific utilization initiative was orders for comprehensive toxicology testing from the ED. In our laboratory, we perform several variations on toxicology testing, including routine serum and urine drugs of abuse screens, blood volatile alcohols, and comprehensive toxicology analysis (CTA) by chromatographic methods. The latter test is expensive and requires specialized expert technologists to perform. In meeting with the ED physicians, it became clear that the CTA test was being overused owing to various factors, including confusion among nurses and residents about the correct test to order for specific clinical indications and the fact that the CTA test was listed on the ED requisition without explanation as to its intended clinical use. In response, we began an educational campaign among the ED staff and created a new ED requisition that did not specifically list the CTA test. The result was a 59.4% decrease in CTA orders during a 7-month period.

Discontinuing Tests of Limited Clinical Usefulness

A number of traditional tests are known to be antiquated or have limited clinical usefulness. Currently, we bring these tests to the CLAC to get approval from the clinical community to discontinue offering the tests. Specific past examples of discontinued tests include the bleeding time, the 5-hour oral glucose tolerance test, prostatic acid phosphatase, and the tumor marker NMP-22. In other cases, physicians order esoteric testing from a specific reference laboratory when a less expensive alternative is available from our principal reference

Table 4
Test Ordering Guidelines Established for the SICU at MGH

<table>
<thead>
<tr>
<th>Test</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPK</td>
<td>Creatine kinase</td>
</tr>
<tr>
<td>CK-MB</td>
<td>Creatine kinase MB isoenzyme</td>
</tr>
<tr>
<td>TnT</td>
<td>Troponin T</td>
</tr>
</tbody>
</table>

A physician order is required for all laboratory tests. An RN is accountable for all tests sent. Retroactive physician orders are acceptable during acute clinical events. An RN should discuss with the physician and obtain an order before the shift is over. Routine AM laboratory tests are defined as CBC, Na, K, Cl, bicarbonate, BUN, creatinine, glucose, magnesium, and phosphorus. Duplicate laboratory tests are not acceptable. Additional routine AM laboratory tests include TPN laboratory tests as ordered on the TPN template and blood bank samples every 72 h. Routine AM laboratory tests and patient-specific laboratory tests are ordered on SICU rounds and sent on the night shift if possible. Postrepletion electrolyte laboratory tests can be sent as needed and are ordered on the POE laboratory screen or using the SICU electrolyte template. Arterial blood gases are not routine and require a physician order. PT, PTT, and troponin-T are not routine admission laboratory tests. Admission laboratory tests are generally not STAT and may be done at any appropriate time within the first hour of admission. MGH guidelines for diagnosing acute myocardial infarction

- Time 0: Troponin-T, CPK, CK-MB
- Time 8 h: Troponin-T
- Time 16 h: Troponin-T

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laboratory. An example is confirmatory testing for Lyme disease. Some of our clinicians were using a specialty laboratory for Lyme disease confirmation testing. By using the CLAC, we instituted a policy wherein our main reference laboratory, which offers a less expensive confirmatory test, became the standard laboratory for all of our Lyme disease confirmatory testing. The practice of ordering tests offered by alternative laboratories was discontinued.

Another area in which we have been active in managing service-specific test utilization is medical genetics. The availability of many new genetic tests has had a significant impact on our reference laboratory budget. At the MGH, the use of outside reference laboratories has increased more than 4-fold during an 8-year period. Reference laboratory testing accounts for approximately 1.06% of total tests by volume but 12.4% of the total laboratory budget. This growth is mainly due to new molecular diagnostic tests. Our approach with the medical genetics group has been collaborative. We meet regularly with the pediatric genetics group and discuss genetic send-out testing. During these meetings, we share genetic send-out test ordering data at the individual provider level and assist the group in developing practice standards for ordering expensive genetic tests. The result of this effort has been a sustained (6 months of data) annualized 20% reduction in pediatric genetics reference laboratory expenses, in contrast with the 15% to 20% per year increase seen before our collaboration with pediatric genetics.

Establishing Practice Standards

A number of clinical laboratory evaluations have medically validated standardized approaches. A classic example is the thyroid screening algorithm. Developing practice standards is particularly useful when a variety of tests are available to evaluate a specific clinical condition. Practice standards and reflex algorithms are especially important when clinicians are confused about the most efficient approach to evaluate a particular condition. For example, we have a number of algorithms for the evaluation of coagulation disorders. The algorithms are supported by a clinical pathology consult service to aid clinicians in the selection and interpretation of coagulation testing. In a 2004 study, it was reported that the algorithms and interpretable service reduced the number of test order errors by physicians by 1.9 errors per requisition, reduced the time required to obtain a diagnosis, reduced the number of tests ordered, and may have reduced hospital admissions and blood product use. Another example of using practice standards is our introduction of the standard RO-AMI protocol described in "Use of Admission Templates."

Approach to “Investigational” Testing Technologies

Some laboratory devices or tests may be considered investigational in that they have never been approved by the FDA and are not generally considered standard of care. Examples include various tumor markers, cancer genetics, and thromboelastography (TEG). Physicians may request that these tests be made available. Our approach to these situations can be illustrated by TEG as a point-of-care test in our cardiac operating rooms. In 2001, clinicians requested authorization to perform TEG. Our response was that this test was investigational and that they would require institutional review board approval to manage patients using an investigational technology. This would require a full institutional review board application, patient informed consent, and a considerable amount of documentation. TEG has never been implemented in our hospital.

Discussion

Our experiences with managing utilization of laboratory services demonstrate several consistent themes that are important to achieve ongoing success. First, an organizational structure within the health care organization is essential to facilitate review and approval of utilization-related initiatives. This structure should include key clinicians who have credibility with their peers and are empowered with institutional authority to make decisions impacting clinical services.

The organizational chart supporting utilization management at the MGH is an example of the broad interdepartmental-based infrastructure that we recommend to drive the monitoring, review, and approval processes for a utilization management program, as this structure provides durability and legitimacy to the process. A standing committee of clinicians and clinical pathologists (such as our CLAC) provides a forum to screen and evaluate specific initiatives. Such a committee can also approve small utilization initiatives that do not merit the attention of senior hospital management. For example, in her experience, having an organizational structure for evaluating utilization management is particularly helpful in managing requests for new tests. We routinely use the CLAC to evaluate the appropriateness and medical necessity for new test requests. A significant number of requests have been declined or significantly modified.

To be effective, the organizational structure should also include clinical pathologists in committee leadership roles. Clinical pathologists have an intimate knowledge of the use and limitations of laboratory testing and are well positioned within the organization to provide decision support to clinicians when tests are being ordered. As part of their professional duties as laboratory directors, clinical pathologists are ideally suited to monitor test volumes, identify opportunities for utilization management, review budgets for in-house and send-out testing, examine aggregated utilization data, and set priorities for testing services. We have found that most
laboratory utilization initiatives in our hospital originate from pathologists. Although many clinicians are interested in appropriate utilization of laboratory services, this activity is not part of their regular duties. For these reasons, clinical pathologists are uniquely positioned to lead institution-wide utilization programs.

Second, robust systems for surveillance of laboratory test ordering patterns are essential to identify utilization opportunities and to track the success of specific interventions. Involvement of the hospital information system team is critical to support data collection and implementation of initiatives. At the MGH, the CPOE system has been, and continues to be, an important interface for communicating and implementing test utilization programs with clinicians. In addition, the laboratory should develop a system of metrics to evaluate utilization interventions individually and more globally to assess the success of the overall utilization management program. Our global metric has been the number of tests per inpatient discharge. This metric normalizes our test volume data, as hospital admissions change over time.

Third, each utilization issue presents unique challenges that must be appreciated. There is no standard “one-size-fits-all” approach to laboratory test utilization initiatives. Instead, a variety of tools are available to support utilization management (eg, provider order entry, admission templates, requisition redesign, implementation of practice standards, service-specific committees, banning selected tests, Web-based targeted education, and consultant-gatekeeper functions). Successful initiatives require the selection of the most appropriate tools to use in any given situation. Examples of archetypal utilization problems are send-out tests to reference laboratories, the so-called daily labs, and specialized tests associated with specific clinical services, discussed briefly in the following paragraphs.

Sending specimens for testing to outside reference laboratories has a clear variable cost associated with volume of orders. National estimates for reference laboratory expenses were $2.5 billion in 2002, with an annual growth rate of about 10%.41 This growth has been mainly due to new molecular diagnostic tests, not all of which have a clear rationale for use.42 Similar trends in expensive molecular testing have been documented at other institutions. For example, one hospital is attempting to contain costs by using pathology house staff as gatekeepers for all send-out tests.43 Given the high degree of subspecialized knowledge required to understand the legitimate use of many esoteric genetic tests, we believe that the gatekeeper approach should be used judiciously and be restricted to situations in which utilization is clearly inappropriate. It is counterproductive to systematically harass clinicians by imposing excessive obstacles to test ordering when many of the test requests may be entirely legitimate. An exception in our institution is the consultant-gatekeeper function we have used for high-cost blood components. Avoiding unnecessary inconvenience of physicians also extends to pop-up screens on provider order entry. Excessive use of pop-up screens will invariably alienate clinicians and be counterproductive to the long-term success of the program.

Excessive ordering of so-called daily labs has been an endemic problem in our institution. Largely, this practice arises from a subset of internists and residents on our internal medicine service. Virtually all internal medicine attending physicians whom we have interviewed agree that routine daily labs are inappropriate and medically unjustified, waste nursing and laboratory resources, and contribute to therapy-induced anemia. One possible exception is daily prothrombin-international normalized ratio determinations in patients starting warfarin therapy. Our house officers give a variety of explanations for ordering routine daily labs, including weakly justified explanations of medical necessity, fear of not having a required laboratory test on daily rounds, and simple convenience in managing their heavy patient load. We have had variable success in controlling daily labs on our medicine service. Educational efforts produced dramatic, albeit temporary, results. More recently, we have been tightening the order entry system, progressively limiting the ordering of daily labs by requiring justification for the order. The justifications are available for review by our clinical pathologists and can be collated according to each resident. The attending physicians on the medical service have been supportive of these efforts and have even advocated blocking daily lab orders using the provider order entry system.

In contrast, managing testing on specific clinical services has been one area in which we have had considerable success over the long term. Examples include our experiences with the SICU,29 special coagulation testing,40 and pediatric genetics. Some reasons for this success are that the individual services usually involve a limited number of physicians and that most clinical services have identified physician leadership. Focused interdepartmental teams are relatively easy to assemble, and implementation can be accomplished by direct personal communication. This contrasts with the situation of daily labs, a practice that is embedded in the culture of a large number of interns and residents. Furthermore, internal medicine house staff have a 33% turnover every year. This high turnover rate introduces a fixed half-life for educational efforts directed at house staff.

Determining when a test may or may not be inappropriately used can be straightforward in the case of obsolete tests such as the bleeding time or may prove extremely challenging. Identifying these overused tests requires reviewing available literature and clinical guidelines, reviewing test ordering patterns with peer institutions, and speaking with local or national experts. Depending on the clinical setting and pretest probability for an abnormal result, a test may be at risk for
overutilization, underutilization, or both. In our experience as a general rule of thumb, screening tests are at most risk for underutilization (eg, Papanicolaou test and cholesterol level), tests for “ruling in or out” a specific diagnosis are most at risk for overutilization, and tests for disease monitoring are at risk for overutilization and underutilization. Overutilization may be tolerated in a population screening program but is not acceptable for expensive tests used for diagnosing a rare genetic disease.

A programmatic approach to utilization management involves prioritizing tests with a high economic, operational, or clinical impact for management review. In general, little argument can be made against reducing or eliminating expensive tests performed at high volume that have minimal impact on patient care. In practice, such items can often be identified from “high-ticket” items in the laboratory budget, with several examples from our institution coming from send-out tests to reference laboratories and blood bank products, which are not tests but are included in most pathology laboratory budgets. Reviewing the test menu may also identify antiquated tests with limited clinical usefulness that should be selected for discontinuation (eg, bleeding time and 5-hour oral glucose tolerance test). Another strategy is to look at tests associated with wide variability in ordering practices. This may be observed for tests that clinicians are less familiar with (eg, special coagulation tests) or when the clinical indications for ordering the tests are not clearly defined. Newer diagnostic tests (eg, molecular testing for hepatitis C virus), specialized tests (eg, factor V Leiden), and conditions with a number of different diagnostic approaches and/or lack of standards are likely to be susceptible to variable ordering practices. Defining the clinical question and looking at testing practices may reveal whether the test is being underutilized, overutilized, or misutilized.

A way to organize strategies for improving laboratory test utilization is by quantifying the volume and cost of specific tests. Low-volume with high-unit-cost tests may be approached with individualized educational feedback, formation of interdepartmental specialty utilization teams, consultant-gatekeeper functions, or limiting test ordering privileges to specific physicians. High-volume with low-unit-cost routine tests usually necessitate more systematic measures, such as modifying the order entry test menu screen, changing a requisition, eliminating the test from admissions templates, or banning the test entirely.

One final caveat concerns the time commitment required by pathologists to sustain our utilization management program. On average, we estimate these activities occupy 19 hours per week for clinical pathologists on the BTS, 12 hours per week for our core laboratory director, 5 hours per week for our director of clinical services (for a total of 36 physician hours per week), and 8 hours per week for administrative support.

Cumulatively, our experiences with utilization management demonstrate that considerable success can be achieved when clinical pathologists exert leadership within an institutional framework that is conducive to interdepartmental clinical practice improvement initiatives. Ongoing sustained effort is required, particularly in an era in which a large number of new diagnostic tests are becoming available.

### Conclusions

For clinical pathologists, managing utilization of laboratory services can be viewed as an aspect of medical professionalism as it relates to the ongoing national dialogue on decreasing health care costs, ensuring patient safety, and improving the quality of health care services. As we have discussed, successful implementation of utilization programs depends on having accurate and timely data on patterns of testing and an organizational infrastructure to approve and

### Table 5I

A Framework for Approaching Utilization Management Problems

<table>
<thead>
<tr>
<th>Low-Volume Testing</th>
<th>High-Volume Testing</th>
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<tr>
<td>Overutilization</td>
<td>Focused physician education and/or establishing group practice standards (in conjunction with leadership of the specialty group) Change to CPOE screen(s) design, redesign paper requisition forms, eliminate standing orders Banning tests</td>
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<tr>
<td></td>
<td>Physician profiling, with utilization profiling Limit ordering privileges to specialists</td>
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<td></td>
<td>Addition of a gatekeeper (require approval before test can be obtained) Find cheaper alternatives, and promote</td>
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<td></td>
<td>Examples Test interpretation services, with recommendation of additional tests, if necessary Reflex testing using laboratory information system</td>
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<td></td>
<td>Electronic mail sent to select clinicians about free-text orders; interpretation services for hypercoagulation testing Use of disease- or syndrome-specific templates</td>
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CPOE, computerized provider order entry.
monitor changes. Particularly with the recent health information technology legislation passed in the United States, CPOE is and continues to become an increasingly important way for clinicians to interact with the laboratory. However, it is too optimistic to assume that all utilization management programs can begin and end with CPOE. Indeed, the majority of successful interventions require direct dialogue and collaboration with clinicians, whether through specialty-based or administrative meetings or individual conversations. In addition, utilization initiatives cannot be haphazardly performed by nonlaboratory experts. Thoughtful choice of laboratory utilization initiatives necessitates having the medical expertise or background knowledge of the test, obtaining buy-in from clinicians, and understanding the practical impact of initiatives on laboratory workflow and on patient care. Clinical pathologists are ideally situated to be in leadership roles for laboratory utilization efforts and should consider such activities to be part of their professional duties.

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References