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Utilization management in the clinical laboratory: An introduction and overview of the literature

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ABSTRACT

There is a broad literature addressing the need for improving utilization management in medical care. Numerous review articles and case studies have described approaches to utilization management challenges in the laboratory. This article will present an overview of the literature on laboratory utilization management and will compile a "toolbox" of strategies that can be used to address specific utilization management initiatives. A clear theme among successful utilization management programs is the need to recruit institutional champions both for the overall utilization management program and for ad hoc assistance with specific utilization challenges. It is important that these individuals represent a cross section of laboratory and clinical specialties and that the group be organized as a committee that has been established by the administrative and physician leadership of the organization. The changing nature of healthcare reimbursement will likely provide increased motivation to control laboratory testing and costs. Clinical pathologists are in a unique position to observe testing behavior patterns, suggest alternatives, implement order entry changes, manage testing algorithms and provide interpretive services for laboratory testing. For these reasons, clinical pathologists have a major opportunity to become institutional leaders in utilization management.

1. Introduction

The topic of utilization management in the clinical laboratory has been described in a number of review articles over the years [1–11]. This report will not attempt to present an exhaustive review of the literature as this can be assembled from the various articles cited in the references. Rather, our purpose is to highlight key concepts relating to utilization management and to describe examples of different techniques and strategies that have been reported in the literature. Some of our observations are only relevant to the current situation in the United States. In countries where the model for financing health care is significantly different, the motivation and alignment of incentives for controlling utilization may vary substantially.

Inappropriate laboratory utilization includes both over-utilization and under-utilization. Pronounced variation in test ordering patterns between physician practices, hospitals, and across different countries highlights the fact that a significant opportunity exists to reduce utilization of laboratory services [1,5]. Examples of tests that are most subject to over-utilization include routine automated tests such as complete blood counts and chemistry panels. A number of studies have reported on efforts to control the utilization of these tests [e.g. 12–15]. However, many esoteric tests such as broad panels for genetic screening (as opposed to selected testing for the most likely genetic mutations) are also over-utilized. In contrast, some tests, especially screening and monitoring exams [2] (e.g. cholesterol [16], hemoglobin A1C, and HIV testing), are clearly under-utilized. In some cases, performing these tests is increasingly required as part of physician pay-for-performance programs and physician-payer risk sharing insurance plans. Finally, there are a number of tests that fall into a more questionable category where their utility in terms of producing actionable clinical information is either poorly defined (high sensitivity C-reactive protein) or hotly debated (prostate-specific antigen testing to screening test for prostate cancer). In the case of PSA screening, there continues to be significant debate even in the face of published national guidelines.

The issue of inappropriate laboratory utilization is hardly new but has received increasing attention internationally due to pressure to reduce health care spending in many developed countries. Technological advances in recent decades have created a clinical laboratory infrastructure with significantly expanded capacity to accommodate high volume testing with a rapidly expanding test menu. Turnaround time has also been significantly reduced. Collectively, these developments have enabled a rapid expansion in laboratory test utilization. This trend has been closely paralleled by steadily increasing costs, prompting renewed pressure to control utilization [7]. Some of this pressure arises from the common perception that laboratory testing is often grossly over-utilized. For example, one early study using retrospective chart reviews reported that pathologists and clinicians deemed 26.5% and 42.8% of ordered laboratory tests unnecessary, respectively. Further, the top ten most commonly ordered tests were the most likely to be thought unnecessary [17].

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While the cost of laboratory testing is justifiably a motivating force behind efforts to control utilization, the clinical laboratory comprises only a small percentage (about 4%) of the budget of most hospitals. Therefore, reductions in individual test volumes have a relatively small impact on the overall operating budget of the hospital. However, laboratory tests are estimated to impact up to 60 to 70% of all medical decisions [18]. Consequently, the downstream costs of laboratory testing – both appropriate and inappropriate – are substantial. These downstream costs include workups for abnormal test results, a significant percentage of which are falsely abnormal. Most normal reference ranges for common laboratory tests are established as the mean of a normal population plus or minus two standard deviations. 5% of all test results will be by definition falsely abnormal. For a laboratory performing 5 million tests per year this translates into 150,000 falsely abnormal test results. The clinical work-up of the abnormal results consumes the time of physicians and may prompt further radiological studies and laboratory testing.

While it is generally accepted that between 10 and 50% of laboratory tests are unnecessary [17], clearly defining what constitutes appropriate utilization has proven to be challenging [6]. Criteria to determine what testing is appropriate and the correct frequency of testing are often subjective. In most cases, there are no evidence based standards that can be applied to a given utilization management problem. For example, what is the appropriate frequency of testing for a complete blood count in the typical hospital patient? In many cases the frequency of testing is defined in entirely arbitrary terms such as daily, weekly or, in the case of screening tests, annually. These definitions may be convenient in that they are easy to remember but are, in the end, completely lacking an evidence base. As a general guide, it is important to remember the classic teaching standard from George Lundberg who said in 1975, "laboratory tests should not be ordered without a plan for using the information gained. What will be done if the test result is abnormal? High? Low?" [1,19].

The menu of available tests in most hospital laboratories is quite large. For example, the test menu in our hospital includes over 1600 tests. Developing evidence-based criteria for the appropriate ordering for each test across a diverse spectrum of clinical disorders would be an impossible burden; though, when it does exist, it should be followed. Some criteria have been found to be generalizable across patient groups and test types: timing and frequency of testing, choice of tests with common indications, clinical indications for testing, and determination of the probability of an out-of-range result [6].

Excessive utilization of laboratory testing not only increases health care costs but also leads to an increased need for phlebotomy. Excessive blood draws in hospitalized patients may result in the development of moderate to severe hospital acquired anemia (HAA: hemoglobin < 11 g/dl) [20]. Hospital acquired anemia has been associated with worse short and long term patient outcomes, including increased morbidity and higher mortality rates [21]. Laboratories have tried to mitigate the incidence of HAA by resorting to the use of smaller blood tubes and by consolidating more tests onto a single specimen type. In spite of these efforts, HAA remains a significant problem.

Calculating the cost of a laboratory test or test panel can be challenging. Consequently, determining the savings if the test is not ordered is equally problematic. Costs (to produce laboratory tests) must be differentiated from charges to patients or third party payers. A number of studies reporting on the savings from utilization management initiatives have wrongfully used charges to assess savings to the hospital. When assessing the financial impact of reducing test utilization, it is important to view the problem from five different perspectives:

1. The cost to the laboratory or hospital
2. Potential revenues to the laboratory
3. The charge to the payer
4. The cost (if any) to and impact on the clinician
5. The downstream costs of clinical care.

Third party payers are concerned only with what they are charged. It is of no consequence to them how much the test costs to produce. In most situations, laboratory testing for inpatients is not directly reimbursed but rather is folded into a single fixed global payment for an episode of care under a diagnostic related group (DRG; e.g. admission for heart failure). The payer is not concerned with how many tests are performed on a given patient admission because they only reimburse a fixed global payment. For this reason, many hospitals emphasize utilization reduction of testing on inpatients; performing fewer tests generates a greater revenue margin from the global payment. In contrast, outpatient testing is usually reimbursed directly (in the United States) and can be quite profitable for the laboratory. The hospital has little incentive to reduce utilization of outpatient testing in this case. However, the payer has a significant interest to reduce excessive testing on outpatients as they get billed directly for each test that is performed. The perspective of physicians is nuanced and can be quite complex based on the situation. Physicians in the United Sates are frequently paid for services under Medicare part B. While most physicians genuinely want to do the right thing, there is often no financial incentive to reduce utilization of diagnostic tests. In cases where physicians have on-site physician office laboratories, significant revenue can be brought into the practice by billing for outpatient testing. Many physicians have recently joined large group practices or are direct employees of health care systems. These "staff physicians" have a vested interest in the financial success of their employer and are generally more motivated to promote rational utilization of ancillary testing. The reimbursement system in the United States is moving toward a model of global payments for services (as opposed to fee for service). The incentive structure for physicians will change dramatically under this new model. Many physicians are now participating in "at risk" insurance contracts where quality and cost performance targets are linked to insurance payment withholdings. Failure to meet the predetermined benchmarks may result in forfeiture of the withheld payment. The federal government has recently begun pilot projects for global bundled payments which include both hospital charges under Medicare part A and physician charges under Medicare part B. Under this arrangement the physician and the hospital will share a single global payment. If this approach becomes the norm, physicians will suddenly have a strong incentive to reduce utilization.

The total cost of a test includes pre-analytical costs (e.g. phlebotomy, transport and specimen processing), analytical costs (fixed, variable, direct and indirect laboratory expenses), and post-analytical costs (result reporting, specimen storage and the downstream clinical impact of the test). The cost per test does not include the time and cost to the patient to get to a phlebotomy site. For automated testing the analytical costs typically represent only small portion of the total cost of a test. Likewise, when these tests are eliminated from a pre-existing operation, only the variable cost of the test is actually saved. Thus removing a single test from a multi-test chemistry panel achieves little in true cost savings. To the extent that most clinical laboratories have high fixed costs, the savings resulting from a reduction in automated testing are often disappointing. Winkelman estimated that a 10% reduction in automated testing results in only a 1.32% reduction in cost because only the marginal (variable) cost of the tests is actually saved [22]. For high volume automated testing it is usually best to target elimination of entire test panels (or tubes of blood) as this reduces pre-analytical, analytical and post-analytical costs. Unlike eliminating one test from a panel, the savings can be significant when entire panels are eliminated. Conversely, for tests that utilize expensive reagents such as molecular diagnostics, their variable cost is substantial and significant money can be saved by reducing the volume of these tests. When calculating cost savings, it is important to understand the entire process involved in laboratory testing. Failure to appreciate this concept can result in savings that are greatly over or underestimated. Significant errors in cost savings have been published in the literature. Common errors include using charges (instead of

costs) to calculate savings, using an average cost per test as opposed to marginal (variable) costs, and failure to include pre- and post-analytical costs in the analysis.

Eliminating unnecessary testing may result in a number of benefits including decreasing cost, eliminating work-ups of falsely abnormal results and reducing HAA. However, overzealous elimination of testing carries some risk to patient safety. Invariably, situations will arise where a utilization reduction initiative resulted in a missed or delayed diagnosis with potential harm to the patient. Usually these events are anecdotal, but nonetheless the potential for adverse outcomes instills a significant restraint on physicians advocating for utilization management. It is therefore important to include quality measures in any intervention to reduce test volumes [1]. These may include such metrics as ventilator days, length of stay, safety reports or other measures as seem appropriate.

Coincident with the coming changes in the approach of payers to healthcare reimbursement, a number of national physician organizations are beginning to advocate for improving utilization management. The National Physicians Alliance (NPA) recently started targeting utilization management issues in primary care and in various medical specialties. For example the NPA "Top 5" list for Promoting Good Stewardship in Family Medicine discourages the use of Pap smears in women younger than 21 or in women who have had a prior hysterectomy for benign disease. The "Top 5" list for internal medicine discourages the use of chemistry panels and urinalysis for screening asymptomatic, healthy adults [23]. These efforts have been expanded by other physician organizations, all of whom have released or will release "Top 5" lists in 2012 or 2013 through the "Choosing Wisely" campaign [24]. Likewise, the United States Preventative Services Task Force (USPSTF) is continuing to address the appropriate use of screening tests for a variety of disorders. There are, of course, limitations on the impact of guidelines issued by professional societies. First, they can be ignored without significant consequences to the physician. Second, if they are not adequately publicized, many doctors may be unaware of the recommendations. Finally, if guidelines are complicated or difficult to remember many physicians will stay with their traditional practice patterns. Most frustrating to practitioners is when different organizations publish contradictory statements. One such example is the controversy over PSA screening recommendations by the USPSTF. The guideline recommends against PSA screening in adult men [25]. Many physicians involved in the care of prostate cancer, including urologists and oncologists, believe that the Task Force recommendations were unwarranted based on currently available data and would result in late diagnoses of prostate cancer, especially in high-risk, younger populations for whom screening is the most relevant [26]. A final issue concerns potential conflicts of interest among physicians. When a particular medical specialty derives a significant portion of its income from performing a screening test (e.g. colonoscopy) or treating patients identified by a screening test (e.g. PSA), it is difficult to remain entirely objective. However, it is these same physicians who are usually called upon to develop guidelines within their own specialties. One final point concerning guidelines relates to medical legal liability. Physicians are frequently sued for damages in the event of an adverse medical outcome. If the physician can demonstrate that he/she was following established practice guidelines, the likelihood of a successful defense is significantly increased. National guidelines concerning utilization management are therefore important not just in defining a standard of care but also in providing clinicians with a measure of protection against possible lawsuits.

While we lack absolute clarity about what is considered appropriate utilization for many tests, there is near universal agreement that the need to reduce laboratory utilization is no longer a controversial topic. Utilization management has become an essential component of good clinical practice and, for pathologists, an integral part of laboratory management. A number of approaches to tackling utilization management have been described in the literature. Most of these are situation-specific and there is no one approach that will be effective in every circumstance. For this reason when starting a utilization management initiative it is important to select implementation tactics that are best suited to the individual challenge. The majority of the literature on utilization management in the laboratory has come from academic medical centers. Medical house staff are frequently the targets of these utilization management efforts because they order the majority of the tests. Yet, most of the medical care that patients receive occurs in the community in private practice settings. The applicability of many studies on utilization management to community practice is often limited. Nonetheless the basic "tools" for utilization management are pretty much the same across different practice settings. The remainder of this article will describe various utilization management tactics that have been reported and highlight those that have been shown to be particularly effective. The purpose of this discussion is to assemble a "toolbox" of potential strategies that may be employed to address individual utilization management challenges as outlined in Table 1.

2. A toolbox for laboratory utilization management tactics

2.1. Physician education

Education of medical students, house staff and staff physicians is intellectually appealing as it implies respect for clinical judgment and does not overtly limit physician autonomy. Educational interventions have been broadly reported but their effectiveness is often limited and deteriorates with time following the intervention. Reports of "top-down" approaches such as lectures and bulletins have shown variable results. Some studies have reported minimal effects [27], while others have shown a significant impact on laboratory utilization [28]. In some cases collaborative approaches that address specific testing habits with the development of guidelines followed by education about the guidelines to house staff have been quite effective [1,29]. However, the regular turnover of house staff in academic medical centers necessitates an ongoing approach to education which is difficult to sustain. In many cases maintaining individual initiatives through education has proven quite challenging [13,14].

A subset of education-oriented interventions has focused on educating providers about the cost of laboratory tests. Because of the complexities in determining the true cost of laboratory tests, applying specific dollar values to tests can be difficult. An alternate approach is to assign relative costs such as +1, +2. +3 or low, medium, high. In our institution we use a system of dollar signs; $, $$ or $$$. Advertisement of costs, particularly at the time that the test is being ordered, has proven to be somewhat effective, but requires ongoing education. For example,

Table 1
Examples of strategies to approach laboratory utilization management challenges.

Physician education
Practice guidelines
Posting test costs
Physician profiling
Restrictions on testing
Discontinue obsolete tests (banning)
Use of gatekeepers
Establish a laboratory formulary
Requisition design
Develop admission templates
Order entry design[a]
Decision support
Testing guidelines
Use of "pop-ups"
Develop algorithms and reflex testing protocols
Benchmarking against peer organizations
Clinical pathology consult services
Financial motivation including risk sharing and pay-for-performance

[a] Order entry systems may be used to support most of the strategies listed in this table.

one study reported the impact of educating house staff about the cost and appropriateness of laboratory tests that had been ordered by the residents in the preceding month. They demonstrated a decrease in test utilization after the intervention. However, the reduction was not sustained beyond the immediate post-intervention period [13]. Implementing a program for ongoing education on the cost of testing can be facilitated by the use of computerized order entry [14]. The advantage of this approach is that once the order entry intervention is set up it will continue automatically until it is changed or discontinued.

Feedback to clinicians about their ordering habits including physician profiling is another popular type of educational intervention. One group in Canada reached out to the heaviest users of laboratory testing and offered them the opportunity to participate in a utilization program. The program included four meetings over two years, wherein utilization data for the individual physicians was highlighted. They reported a sustained decrease in utilization by these physicians. They also recommended using multiple approaches, including communication, individualized feedback, and peer pressure. Of note, this intervention took place in the context of a capitated reimbursement system, with financial pressure on both the laboratory and the physicians to decrease testing [30].

Overall, educational interventions can be effective, particularly when they are focused on a small, relevant group of clinicians and tests. However, the process can be quite time-consuming. Maintaining changes in test ordering habits through education is most effective when combined with other synergistic interventions or when there are outside financial pressures [1,30,31].

2.2. Imposing limitations on testing

In contrast to educational interventions, imposing limitations on test ordering is often associated with a perceived loss of autonomy. For restrictions to be successful, communication and collaboration with appropriate clinical leadership are essential [32]. The first step is to determine who that clinical leadership is. Depending on the intervention, this could be a residency program director, a chief medical officer, a subspecialty chief of service, or a medical policy committee.

The most straightforward example of restricting test ordering is for the laboratory to stop offering a specific test. This approach can be quite effective when the test is deemed to be superfluous, inappropriate, or outdated by a hospital committee or when a pathologist coordinates the initiative with key clinical leadership [8,32,33]. A typical example is the bleeding time test which has been shown to have little correlation to the future risk of intra- and post-operative bleeding.

Unfortunately, most tests that are subject to inappropriate utilization are entirely appropriate under some circumstances and cannot be universally banned. For relatively low volume expensive tests with potentially high rates of inappropriate ordering, a gatekeeper method can be employed. Choosing the appropriate tests and the gatekeepers are essential. The key is to select high unit cost tests that are only low to moderate volume. For example, reference laboratory “send-out” testing has been steadily increasing in volume in most hospitals [34] and constitutes a significant part of the overall laboratory budget. Cost accounting for send-out testing is relatively straightforward because the hospital is billed directly for each send-out test. Further, most send-outs are lower volume high unit cost tests making them ideal targets for gatekeeping. Because of the large size of most reference laboratory budgets, send-out tests are often targeted as an opportunity for cost control. An aggressive intervention reported from a laboratory in Canada required a written explanation for any requested send-out tests over twenty Canadian dollars. The request required subsequent approval by a laboratory director. The intervention resulted in approximately half of the tests being canceled with savings exceeding sixty thousand dollars [35]. Most gatekeeper approaches are generally less restrictive but similarly require approval from either a pathologist or appropriate clinical specialist. In one study a simple gatekeeper approach was used in a surgical intensive care unit (SICU). All tests that were requested from the SICU were required to have a physician's order. Nurses were no longer allowed to preemptively request laboratory tests. This intervention was augmented by test ordering guidelines that were distributed to the physicians. The combined intervention resulted in a sustained 30% decrease in testing volume without compromising the quality of care (Fig. 1) [29].

2.3. Order entry

Maintaining a utilization management program through education can be challenging. The time required for continuing education can seem nearly futile especially when paired with constant physician turnover particularly of house staff who order the majority of tests. One solution is to incorporate guidelines directly into an order entry system. The specific guidelines can be either locally developed or derived from national guidelines.

Order entry systems essentially replace paper requisitions albeit paper requisitions remain common in many hospitals. Many lessons have been learned in the past from redesign of paper requisitions to impact utilization management. Some of these lessons can be applied to computer order entry systems. For example, under appropriate circumstances, removing a test from a laboratory requisition will result in a significant decrease in requests for that test. Many order entry systems employ a “quick choice” screen listing the most commonly ordered tests. These screens are designed to make the ordering of laboratory tests convenient for the physician. Simply removing a test that is generally not indicated for most patients can be quite effective [6,33]. This is particularly true when an alternative test, which may already be present on the screen, is the more appropriate option. For example, we removed several tests including LDH and total CPK from our order entry “quick choice” screen. In the case of LDH, the volume of test requests decreased by over 50% (Fig. 2) [33].

While physicians view each of their patients as unique, certain clinical presentations (e.g. chest pain, heart failure) typically require a predictable set of nursing, medication, and lab test orders. Implementing admission templates to standardize orders for common patient presentations will eliminate many unnecessary tests and avoid duplication of test requests which often occur when patients navigate around the hospital from one service to another. For example, some years ago we implemented a “rule out myocardial infarction (AMI)” template in our hospital. The template specified the appropriate sequence of cardiac markers that would be required. This resulted in a significant decrease in orders for total CPK and CK-MB and an increase in the more appropriate test, cardiac troponin. We subsequently eliminated CK-MB altogether from the “rule out AMI” admission

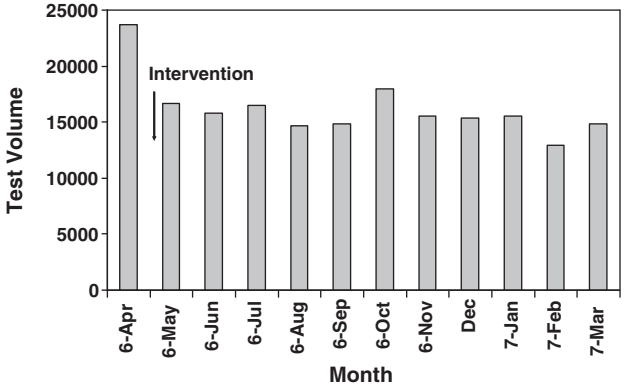

Fig. 1. Surgical intensive care unit (SICU) laboratory utilization management initiative. Figure shows the monthly laboratory test volume in the SICU over time.

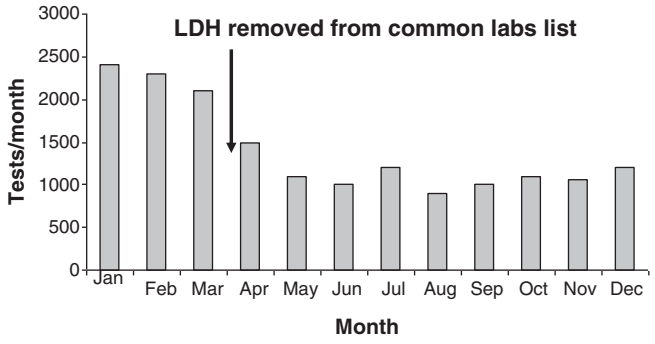

Fig. 2. Lactate dehydrogenase (LDH) monthly test volumes. Figure shows the number of LDH tests per month over time.

template resulting in an 80% decrease in requests for CK-MB (Fig. 3) [33].

More complex decision support can also be achieved through modifications of the order entry system. One study described a significant reduction in tumor marker tests following reorganization of the test order form to clarify which tumor markers were relevant for which tumor types [36]. This type of guidance can be easily incorporated into an order entry system. A common use of computerized order entry systems was recently described in our hospital [37]. A "pop-up" message was created to flag inpatient orders for 1,25-dihydroxy-vitamin D (1,25OHD). The "pop-up" message redirected the physician to order 25-hydroxy-vitamin D which is the screening test of choice for vitamin D deficiency. This intervention resulted in a 70% decrease in testing for 1,25OHD (an expensive send-out test) with a corresponding increase in the less expensive appropriate in-house test for 25OHD [37]. In another scenario, we used an order entry "pop-up" message to discourage physicians from ordering CK-MB in the evaluation of acute coronary syndromes. The approved protocol for acute coronary syndrome in our hospital utilizes serial (three) measurements of troponin T. CK-MB has been eliminated from the protocol. This intervention resulted in an 80% reduction in requests for CK-MB. As these examples illustrate, the potential for using order entry to promote educational guidelines is encouraging and will expand with wider adoption of electronic medical records. The major advantage of order entry is that the intervention occurs at the time that the physician orders the test rather than after the fact. Further, once implemented, the intervention requires no further effort to achieve sustainability.

Another approach for using order entry is to introduce electronic test ordering algorithms and reflex testing panels in place of ordering individual tests. These algorithms are usually developed by a multidisciplinary team of physician specialists and clinical pathologists. Algorithms and automated reflex testing panels allow clinicians, especially non-specialists who are responsible for the majority of test orders, to easily select the appropriate cascade of tests. Additionally, the laboratory can do confirmatory and next-step testing if a screening test points in one direction or another. Finally, reflex testing allows a sequence of tests to be performed without requiring the patient to return to the hospital for additional blood draws. Without automated algorithms, the physician will anticipate the difficulties of having to bring the patient back for follow-up testing and will therefore tend to order a battery of tests up front and many will turn out to be unnecessary. Examples where the use of algorithms in order entry systems have been shown to be successful include thyroid testing [12,38], urinalysis [12,38], anemia work-ups [38] and coagulation abnormality investigations [39]. An example of one such algorithm for an elevated partial thromboplastin time used in our institution is shown in Fig. 4. In another example, we recently introduced a celiac disease screening algorithm using tissue transglutaminase (TTG) as the initial point test and placed the "celiac screen" on the laboratory requisition. Previous to this intervention physicians typically ordered at least two and often three tests (TTG, anti-gliadin antibody and anti-endomysial antibody). Much of this test ordering was due to confusion over which test(s) was the most appropriate. The presence of the "celiac screen" on the requisition (without the specific individual tests being listed) provided a low-tech approach to decision support. Physicians now simply check the "celiac screen" box in most cases and let the laboratory work through the algorithm. As a result, the test volume for anti-gliadin and anti-endomysial antibodies has fallen dramatically.

2.4. Clinical pathology consultation services

Beyond playing a key role in utilization management educational initiatives and developing practice guidelines and algorithms, there is a significant opportunity for clinical pathologists to develop clinical consultative services. Having a pathologist available for questions about laboratory tests is an important but often overlooked resource. Pathologists are also especially well suited to function in gatekeeper roles because they are aware of what testing is being ordered across the hospital. As an example, pathologists in our blood transfusion service function as gatekeepers for a variety of expensive blood components including intravenous immunoglobulin, recombinant Factor VIIa and respiratory syncytial virus immunoglobulin, saving over one million dollars. Our clinical microbiologists manage an antimicrobial stewardship program for expensive antibiotics such as carbapenems. Finally, our director of special coagulation has been active in reducing utilization of expensive anticoagulation drugs such as argatroban. Beyond these well established roles for laboratory-based pathologists, some clinical pathologists have established formal consultative services where the pathologist generates written interpretations of test results. In our institution, clinical pathologists provide interpretations for complicated laboratory results, such as coagulation work-ups,

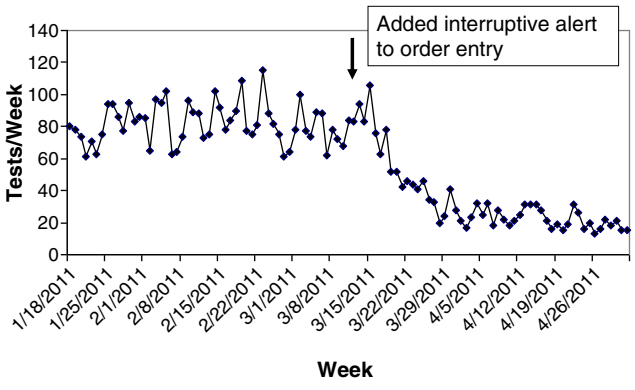

Fig. 3. Inpatient testing volume for creatine kinase-MB (CK-MB) per day over time.

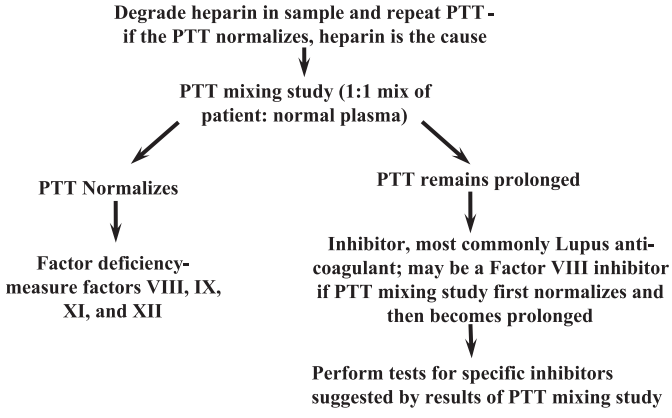

Fig. 4. Reflex algorithm for a prolonged partial thromboplastin time (PTT) evaluation.

hemoglobin electrophoresis, indeterminate HIV tests, and complex toxicology and endocrinology results. These interpretations integrate patient information with the test results and have been shown to shorten the time to diagnosis, reduce errors and misdiagnoses, and save the clinician time [40]. Consultative services are likely helpful for the same reasons that testing algorithms are; general physicians order a large number of tests but even the most experienced physicians struggle to learn the subtleties of specialized areas of laboratory testing especially when there are frequent changes in laboratory instruments, testing reagents, and the test menu as new tests are introduced into the laboratory [39].

2.5. Financial motivation

With health care spending in many countries increasing at unsustainable rates [41], policy reforms that aim to reduce spending while maintaining or increasing quality are becoming increasingly popular. Many of these reforms transfer some responsibility (risk sharing) for the cost of laboratory testing, radiology, and specialist referrals directly to primary care providers, physician organizations or hospitals. Unlike capitated health insurance plans of the 1990s which centered strictly on reducing costs, these new health care financing schemes also build in quality and cost-sharing incentives. An example of one such plan is the Alternative Quality Contract of Blue Cross Blue Shield of Massachusetts. Like the accountable care organizations of Medicare, the plan operates on a global payment system with shared savings and pay for performance financial incentives for hospitals and physician groups involved with the plan. In the first year of operation, one of the areas where decreased spending growth was observed relative to payment by a traditional fee for service arrangement was in laboratory testing [42]. Some of these savings were achieved through switching testing to a less expensive laboratory. Nonetheless it is clear that physicians can be motivated by financial incentives with regard to testing. Laboratories that can provide support for ongoing utilization management will be well positioned in this new financial environment.

2.6. Structural changes

Hospitals and hospital networks have been getting larger through mergers and acquisitions. With this has come an increasing diversity of specialist physicians. Each group of specialists has their own unique laboratory needs. It is essential to balance these needs for new and established tests with available laboratory space, time, and financial resources. Structuring an approach to balancing these competing needs requires formal cooperation between pathology and clinical departments. In one report, Warren described the formation of laboratory formulary committee at the University of Michigan [32]. This approach is analogous to pharmacy formularies that have existed for a number of years. In the pharmacy formulary model, if a physician prescribes an expensive brand name drug, the hospital formulary may only carry a less expensive generic version of the drug or, in some cases, many not carry the drug in the formulary at all. The laboratory formulary committee described by Warren includes representation from clinicians and pathologists. The committee meets monthly and regularly solicits additional information from relevant specialists and from the literature to address the use of new or existing tests. Utilization management data is followed for targeted tests and, in some cases, algorithms have been introduced to the formulary. A computerized order entry system is used to help circulate testing recommendations and requirements. Following introduction of the formulary there was a reduction in send-out (referral) testing and a decrease in the volume of in-house tests that were being followed by the committee. These results demonstrate the value of collaboration between pathologists and clinicians and the importance of an organized, formal, utilization management program. A similar program exists at the Massachusetts General Hospital, as has been previously described [8,33]. Briefly, the Clinical Laboratory Advisory Committee, which includes pathologists and clinician representatives, focuses on laboratory issues, including utilization management. The committee reports to the Hospital Medical Policy Committee which is responsible for all matters relating to medical policy in the institution. This formal organizational structure designates responsibility for laboratory utilization management to a specific committee thus giving the committee an institutional legitimacy.

2.7. Auditing utilization

An essential step in utilization management is to understand what tests are being ordered, in what volume, by which clinicians and for what purpose. This is best accomplished through monitoring test ordering behavior and the laboratory budget [11]. As described previously, one of the most challenging aspects of controlling utilization is understanding which tests are being over (and under) utilized. Tracking laboratory test ordering behavior can be approached in a variety of ways (e.g. tracking the number of tests ordered per inpatient discharge, by physician, by specialty or ICU, by outpatient practice, or over time). Choosing which benchmark to compare these data to can be problematic. Comparing in-house data to other peer hospitals is useful when the patient population and services offered by the hospitals are similar (e.g. academic medical centers, large community hospitals, small community hospitals). However, comparisons using benchmarking data can be very misleading when, for example, a large tertiary care academic medical center is compared to a community hospital. Benchmarking data can be very useful when it identifies significant variations in practice behavior among different institutions. For example, our hospital network (Partners Healthcare) formed a cardiac surgery care redesign initiative. Analysis of different hospitals in our network revealed that our institution was the only one in the group that was using Factor IX concentrates in cardiac surgery. When this observation was announced to our cardiac surgeons, there was a large decrease in the use of Factor IX concentrates in our cardiac surgery program (Fig. 5). It is also essential to understand how test volumes are actually counted. For example some hospitals count a basic metabolic panel (BMP) as one test. Other hospitals may count a BMP as seven tests. Within a hospital, patient floors representing similar medical specialties can be grouped together (e.g. medicine, surgery, pediatrics), and different specialties will have varying requirements for laboratory testing. Typically, internal medicine services and intensive care units order the greatest volume of tests and the most tests per patient per day. Comparing utilization data over short and long term time frames is helpful in detecting changes in test ordering behavior (such as an

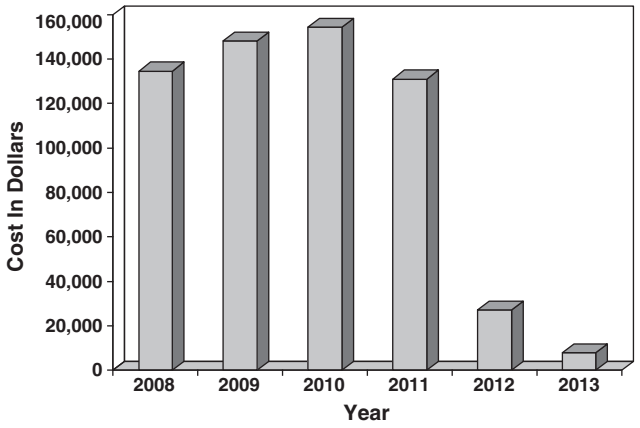

Fig. 5. Annual cost of Factor IX concentrates used in cardiac surgery at the Massachusetts General Hospital by fiscal year. Value for fiscal year 2013 is an estimate based on usage fiscal year to date.

increase in testing for vitamin D). Developing a regular schedule of utilization audits and diversifying the types of data that is to be gathered is the best approach to identifying inappropriate utilization. It is essential to establish an automated electronic surveillance system to sustain a successful laboratory testing auditing program. Manual utilization audits are extremely time consuming and will tend to fail over time.

3. Conclusion

There is a broad literature addressing the need for improved management of laboratory utilization. Numerous strategies for approaching specific utilization management challenges have been described. Not every approach is appropriate in every situation. Just as laboratory tests are ordered based on a patient's clinical presentation, the best utilization management tool(s) is chosen to fit the specific utilization management challenge. Combining physician education with "hard stop" modifications to an order entry system is often the best approach.

A clear theme among successful utilization management programs is the need to recruit institutional champions for the overall program and for ad hoc assistance with specific utilization management challenges. It is important that these individuals represent a cross section of laboratory and clinical specialties and that the group be organized as a committee that has been established by the administrative and physician leadership of the organization.

The changing nature of healthcare reimbursement (including accountable care organizations and risk sharing arrangements between providers and insurance payers) will likely provide increased motivation to control laboratory testing and costs. At the same time it will be important to monitor quality measures including specific quality outcomes relevant to utilization management interventions. Clinical pathologists are in a unique position to observe testing behavior patterns, suggest alternatives, implement order entry changes, manage testing algorithms and provide interpretive services for laboratory testing. Further, clinical pathologists understand the financial structure of the laboratory and how different interventions will impact laboratory costs, revenues, and charges to third party payers. For these reasons, clinical pathologists have a major opportunity to become institutional leaders in utilization management.

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