To Err Is Human Continued: A Failure of Follow-up

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It is incontrovertible in modern medicine that the failure to follow up abnormal laboratory results jeopardizes patient safety. Alarmingly, however, this failure is so common that it is almost normative. Despite the availability of technology to develop systems that appropriately track and manage test and laboratory results, such systems are often absent or inadequate. A longitudinal study of women with abnormal mammograms revealed that about one third did not receive appropriate follow-up care [1]. In a survey of physicians and housestaff at a large urban teaching hospital, nearly a third of physicians reported having no reliable method to verify that the results of all tests ordered are received, with over three fourths of respondents reporting having no method for identifying patients overdue for follow-up [2]. In another survey of providers using an electronic medical record system, only 1 in 5 providers were satisfied with their system of notifying patients of abnormal test results [3]. Interestingly and not surprisingly, an analysis by a large malpractice insurer demonstrated that approximately one quarter of diagnosis-related malpractice cases were due to failures in follow-up [4].

Information systems have been touted as a means of improving the tracking of test results, yet these systems have largely been tested within inpatient settings and involve the reporting of only critical values. In the clinic setting, where the interval between when tests are ordered and actually result may span days to weeks, improving follow-up has been scantily studied. Meanwhile, the magnitude of this problem is growing. The recommended screening tests for primary care physicians have increased significantly over the past 10 years. The U.S. Preventive Services Task Force currently lists recommendations for screening or preventive measures for over 60 topics [5]. A visit to the physician by a healthy woman without any medical problems can spawn a multitude of tests and results that need to be followed up, including lipid panel, mammography, Pap smear, and even fecal occult blood test. Moreover, a skyrocketing number of new medications generates commensurately more laboratory values to be monitored. With every additional test ordered comes an additional result that must be acknowledged. These tests therefore must be ordered with the assurance that a physician is going to review the results. In this paper, we describe the development of a cascading system of electronic view alerts to improve the timeliness of provider notification.

Variability of Test Results Management

There are many reasons why effective handling of test results is not uniform. First, there are systems deficiencies. Laboratory interfaces are not available to every clinic that sends out laboratory and other diagnostic tests, and clinics that have this technology often do not necessarily have a codified system in place to effectively utilize it and appropriately direct laboratory and test results to a responsible provider. Second, the culture of medicine is changing. The concept of shift work, work hour regulations, and a general desire of physicians to be free from responsibility when “off duty” has led to increasing handoffs, confounding the identity of the “responsible” provider. These are litigious days, and the task of review carries a heavy responsibility. An abnormal test means that an identified person is responsible, even legally so, for the communicated results. Lastly, there is a lack of standards regarding follow-up. An “adequate” time frame for follow-up of laboratory and test results has never been established. Obtaining a laboratory result within 24 hours may be essential for 1 physician, while for another waiting a week for that same result may suffice. In fact, the only federal mandate for adequate follow-up has been the Mammography Quality Standards Act, enacted by Congress in 1992 and regulated by the U.S. Food and Drug Administration, which ensures that patients receive a report summarizing the results of the examination within 30 days of the mammogram [6].

In recent years, as the obligation to reduce medical errors has garnered increasing attention [7,8], the Veterans Health Administration (VA) has established a successful history of using information technology to implement systems that promote safe practices. The VA’s Computerized Patient Record System (CPRS) includes computerized provider-entered electronic progress notes, provider order entry, and a laboratory and test reporting interface as a primary
application of VistA, its national health information solution. At our institution, which is associated with a major medical university, although a system had been established to verbally notify physicians of critical laboratory results warranting immediate attention, there was no protocol to ensure the acknowledgment of noncritical yet still essential laboratory and test results.

Alert System
An essential feature of CPRS is the provider notification window, which is a mandatory field on the initial screen seen when a provider logs onto CPRS. At our institution, this window is now configured to display a message that alerts the provider when the result of any ordered test becomes available. When the provider views and then electronically acknowledges the receipt of a result, the result then becomes deleted from the notification window.

Although the notification box ensures that the result of every test is reported back to the correct ordering provider, it does not ensure that the results are viewed by the provider. Because our VA maintains a residency-run primary care clinic, this inadequate follow-up system was particularly concerning in the outpatient setting due to the length of time between patient appointments. Residents at our program are assigned a half-day of clinic weekly, divided equally between the VA and another hospital with a different electronic medical records system. Between night float shifts, rotations at outside hospitals, the elimination of clinic on-call days, as well as residency review committee work hour requirements, it is possible that a substantial amount of time may elapse between scheduled clinic days. It is often difficult for residents to review test results at times other than the designated clinic dates because the record systems differ between hospitals, and residents must physically be at the VA to review results on CPRS. Therefore, despite having an electronic medical record system designed to alert providers to test results in a timely fashion, these results were stacking up in residents’ notification boxes for weeks to months at a time without being reviewed by a clinician.

Although urgent critical values were called by the laboratory to a physician with verbal confirmation, more subtle results, although equally important, were not being picked up. For example, because a potassium level greater than 6 mEq/L is considered “critical” by our reporting system, a physician would be verbally notified; however, a potassium level of 5.9 mEq/L had the potential to be ignored for several weeks until the ordering resident returned from a rotation at an outside hospital and scrolled through the innumerable results that had collected in the notification window. A radiologist’s reading of a chest radiograph was not guaranteed to be seen for several weeks. Doubling serum creatinine levels or dropping hematocrit levels had the potential to linger in virtual reality, without being acted upon for many weeks. We sought to implement a system to correct this problem and ensure timely follow-up of all results, including noncritical values.

Assignment of “Electronic Surrogate”
All residents are now assigned an attending surrogate who becomes the recipient of electronic test results that have not been acknowledged by the ordering resident in a timely manner. Because residents in our clinic are each assigned a particular attending to act as a preceptor throughout the entire duration of residency training, this preceptor was naturally designated as the resident’s electronic surrogate. The surrogate is more aptly able to arrange necessary follow-up of test results and notifies the resident accordingly. If a surrogate becomes unavailable, the results can be forwarded to yet another attending for acknowledgment, generating a system of cascading notifications. At the system level, we have designated a limit to how long a test result can remain unacknowledged before being forwarded to the surrogate, based upon the type of result.

Our system of surrogate provider notification has now been in place nearly a year and has been overwhelmingly successful. Using this system, no laboratory result will remain unnoticed for more than a few days, and surrogate providers are now able to act on any pressing results. Prior to the implementation of this system, on many occasions patients had presented to their primary physician more than a month after having bloodwork that had revealed a significant abnormality and had not been noticed. Physicians had also noted that radiographic findings such as lung nodules could be accidentally overlooked for weeks to months. Positive fecal occult blood testing was not being quickly reported back to a responsible provider. Most of these errors have now been eliminated. The result of a basic metabolic panel is now forwarded to an attending if not viewed by a resident within 72 hours, and other test results are forwarded after similar time intervals. Both attending physicians and residents have applauded the new system. Besides the obvious patient safety issues, this system has been an excellent source of housestaff education.

Limitations
Despite its success, we do recognize several limitations of this system. Although the result of any test performed is reported and received, this system does not notify the provider if a test is ordered but not performed. In addition, laboratory and other tests ordered by consulting physicians, particularly fellows, do not necessarily get forwarded to the primary physician, and neither do tests ordered by emergency department physicians, causing gaps in the timely relay of information. This system also places more burden
on the attending physicians, who must act on the results of tests ordered on residents’ patients. We are currently in the process of implementing a secure network between hospitals to allow residents to view results when rotating at another hospital. Furthermore, although providers receive results, the system does not ensure that patients are informed of these results, which is a vital component of an effective follow-up system that reduces human error.

**Conclusion**

The development of this surrogate system illustrates a central law of improvement (ie, “every system is perfectly designed to achieve the results it achieves” [9]) and that a simple system change can produce striking results. It is now almost inconceivable that, until recently, we did not have this system in place and a stockpile of unseen test results was accumulating in cyberspace. We strongly believe that our institution is not unique and that the problem of timely follow-up of laboratory and other test results is profoundly underrecognized and almost universal. In our current health care system, improving information systems is only beginning to emerge as a priority. Eliminating the problems related to follow-up will require a paradigm shift within the medical profession to recognize that modern medicine is an information science and that the appropriate relay of information is intrinsic to providing quality care.

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**References**