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No News May Not Be Good News

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Case Objectives

- Describe the frequency with which ambulatory test results are not followed up by providers.
- Appreciate that inadequate follow-up of ambulatory test results needs a system-based solution.
- State how automated results management systems can help with ambulatory test results.
- Understand the hazards of alert fatigue in automated results management systems.

The Case

A 10-year-old girl with a history of asthma was brought by her mother (a nurse) to see a pediatrician because of a 15-pound weight loss over a period of 3 months. There were no notable changes in the child's diet or urination and there were no other systemic symptoms. A physical examination was unremarkable and the pediatrician ordered basic labs on a Thursday morning.

On Monday morning, the patient's mother called the pediatrician's office to obtain the results of the blood tests. The pediatrician was busy all day long but near the end of the day found the result. He was shocked to learn that the patient's blood sample, drawn on Thursday, had a glucose level of 320 mg/dL (normal random blood sugar: 70–125 mg/dL).

The pediatrician immediately contacted the mother and had her bring her daughter to the office. A repeat stat blood test showed that the patient's blood sugar was now 450 mg/dL and she had moderate ketones on a urinalysis (showing early signs of diabetic ketoacidosis, which can be life threatening). She was given insulin and specific instructions on management at home. The patient and mother had to return to the clinic each day for the next few days for ongoing management. The patient did not experience any long-term consequences.

When reviewing the case, the pediatrician was surprised that no one had been notified about the elevated blood sugar level. He came to learn that a fax of the laboratory results had been sent to the clinic on Saturday with the urgent result, but, for unclear reasons, the physician covering for the weekend never saw the result. This clinic did not have an electronic medical record (EMR).

The Commentary

Almost a quarter of all medical errors occurring in ambulatory settings are due to the inadequate follow-up of abnormal test results.(1,2) In fact, the fastest growing area of malpractice litigation involves failures or delays in diagnosis, and 25% of these lawsuits are attributable to avoidable failures in the test follow-up system.(3) Accordingly, follow-up of outpatient test results has become a major priority for organizations and policy makers concerned with health care quality. The National Committee for Quality Assurance (NCQA) includes implementation of reliable systems to effectively track test results as a criteria for primary care practices to attain Patient-Centered Medical Home designation.(4) These safety concerns are echoed by practicing physicians who perceive that follow-up of abnormal laboratory results, as well as the systems used for follow-up, are suboptimal.(5-8) In one survey of 15 internal medicine practices, 83% of physicians reported at least one delay in reviewing test results over the past 2 months.(7) In a different survey of primary care providers at a Veterans Affairs (VA) hospital, of all the tests results that were "missed" (not reviewed in a timely manner), more than 1 in 5 were laboratory results.(8) Physicians also believe that inadequate follow-up of laboratory results harms patients. In a survey of internal medicine residents, 46% stated that, at least a few times a year, they have seen patients' medical conditions worsen due to delays in laboratory test result follow-up.(5)

Unfortunately, the scenario described in the case presentation is all too common. Many studies have chronicled the frequency of missed test results in the outpatient setting.(8-11) One study found that 15% of abnormal outpatient laboratory test results suggestive of diabetes (hemoglobin A1c ? 7% and glucose ? 200 mg/dL) were never followed up by patients' clinicians, and about 9% of these patients likely had unrecognized (and untreated) diabetes.(11) Studies looking at other commonly ordered laboratory tests have shown similar findings. Another study found that, over a 4-year period, the median time for any follow-up for an episode of marked hyperkalemia (serum potassium ? 6.0 mEq/L, which can be life threatening) in a primary care practice was 3 days.(9) Additionally, in 14% of cases of marked hyperkalemia, no follow-up occurred until patients returned for routine follow-up visits or when they visited the practice for problems unrelated to hyperkalemia, such as medication refills. Finally, Schiff and colleagues (12) found that, conservatively, there was no follow-up for abnormal thyroid-stimulating hormone results (indicating hypo- or hyperthyroidism) in more than 2% of patients, and an additional 5% were lost to follow-up and possibly unaware of their results.

Is the inadequate follow-up of abnormal laboratory results due to a lack of effort on the part of clinicians? This is unlikely, given that physicians reported spending more than 70 minutes per clinical day on test result management (7), reviewing, on average, more than 1000 diagnostic test results each week. Typically, this effort is uncompensated time at the end of the day or between patients. This process stretches the human limit for effective data management and likely degrades work performance due to cognitive overload. It is easy to understand how this happens: Most primary care practices are busy environments in which frequent interruptions in workflow are common and lead to errors of omission following an interruption.(13) Consequently, inadequate laboratory test result follow-up is a system problem requiring a system solution—simply asking clinicians to work harder and/or be more diligent is not a sustainable fix.

When assessing system solutions to better manage outpatient laboratory test results, one must consider both information technology (IT) as well as clinical workflow. Despite the heterogeneity and mixed results of published studies, IT solutions such as automated test results management systems, when integrated with electronic medical records (EMRs), can improve laboratory test result follow-up.(14-16) These systems are typically incorporated as decision support features in EMRs that function to alert clinicians to the presence of abnormal laboratory results. Well-designed systems also classify the degree of the abnormality for each result (e.g., mild, moderate, severe) and present relevant clinical information to help clinicians manage the abnormal results. For example, if the system alerts a clinician about an elevated serum potassium result, it will also display drugs in the patient's medication list potentially contributing to the hyperkalemia (e.g., lisinopril, a blood pressure medication associated with elevated potassium levels), as well as displaying recent trends in relevant laboratory results (e.g., serum creatinine). One study showed that timely follow-up for episodes of marked hyperkalemia (serum potassium ? 6.0 mEq/L; normal is 3.5–5.0 mEq/L) increased with implementation of a results management system.(14) Automated test results management systems also improve patient satisfaction with communication of test results and satisfaction with subsequent treatment related to their test results.(15) The features and capabilities of an ideal laboratory results management systems are shown in the Table.(16,17)

Additionally, implementing effective workflows and processes for providers must go hand-in-hand with IT solutions to ensure timely follow-up of laboratory test results. Workflow changes should: (i) ensure that all laboratory tests include the correct ordering provider; (ii) ensure staff have adequate time specifically to review test results; (iii) create policies and systems to ensure that results are consistently communicated to patients in a timely manner; and (iv) provide clear handoff procedures to manage results during times of provider absence (i.e., weekends).(18)

Unfortunately, IT systems have limitations and do not always provide for 100% effective laboratory test result follow-up. Hysong and colleagues found that even with implementation of a results management system, 10% of alerts for abnormal laboratory results went unacknowledged by ordering clinicians, and 7% of abnormal labs lacked timely follow-up after 30 days.(19) The authors attributed this phenomenon to alert fatigue on the part of clinicians. One physician in the study stated, "I counted 150 alerts one day just to see how many were coming in that normal day, and this is a fairly regular day, 150 alerts. That's a lot of time trying to go through that while you're seeing patients, while there's no in between time to try to get caught up."(19) Another physician stated, "One of the issues is just the sheer volume of alerts, and there are a number of alerts that in all honesty [you] really don't have any business seeing."(19) This is a key point, any well-designed results management system should have some method for clinicians to reduce alert fatigue by modifying or turning off alerts for non-critical events.

In the case presentation, it appears the pediatrician had no effective tracking system for following up on abnormal laboratory results and, like many clinicians, followed up on routinely-ordered laboratory results whenever time became available during his hectic schedule. Clearly, a results management system involving IT and workflow components would have facilitated more timely follow-up for the patient. Ultimately, it was the mother's diligence in inquiring about the laboratory tests that prompted the pediatrician to follow up. So, until result management systems become ubiquitous in clinical practice, patients' best protection may be to follow the recommendation of the Agency for Healthcare Research and Quality: patients should always ask physicians about the results of tests taken and not assume that "no

news is good news."(20)

Take-Home Points

- Inadequate follow-up of laboratory test results is fairly common and can lead to patient harm.
- Barriers to effective management of laboratory test results are time pressures and cognitive overload on clinicians.
- Inadequate laboratory test result follow-up is a system problem requiring a system solution.
- Well-designed automated results management systems combined with clinical workflow changes can improve laboratory result follow-up.
- Alert fatigue from poorly designed automated results management systems can be a significant barrier to timely follow-up of laboratory results.

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Table

Table. Features and capabilities of an ideal laboratory results management system.(16,17)

- Capability of determining when ordered laboratory tests have been completed
- Highlighting laboratory test results that require urgent attention
- Presenting results in the context of previous results, medication lists, and problem lists
- Forwarding capability and allowing the use of surrogates during planned absences
- Ability to order additional tests or treatments in the computer system while reviewing results
- Capability of creating reminders to perform tasks in the future
- Capability to select important or critical laboratory test results for more urgent review and customizing alerts to prevent alert fatigue
- A population-based view that allows clinicians and/or nurse care managers to easily identify laboratory test results that appear to have not been reviewed

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