Assessing Diagnostic Test Result Management in a VA Health Care Network

Terry Wahls MD, MBA, Thomas Haugen, MD, Kristin Cowell, MS, and William Becker, MD

When test results are not communicated to patients or acted upon by providers in a timely manner, there can be serious medical consequences. Here, investigators describe a VISN-wide quality improvement initiative to identify the weak links in the results reporting process.

Most primary care providers can recall a case in which an abnormal diagnostic test result was overlooked. It may have been as simple as a still-elevated low-density lipoprotein cholesterol value that came in after the patient's annual clinic visit and went unnoticed, leading to continuation of ineffective medication dosing until the following year's visit. Or, perhaps it was an overlooked elevated prostate-specific antigen (PSA) level or abnormal imaging study that resulted in a delayed cancer diagnosis. No clinician wants his or her patient to experience unnecessary delays in diagnosis or treatment. Furthermore, there is a risk of legal action—for both the provider who ordered the test and the diagnostic service that completed it—when an overlooked abnormal test result interferes with proper disease management.[1]

Nevertheless, increasing evidence suggests that the absence of an appropriate clinical response following documentation of a clinically significant abnormality through diagnostic testing is a common medical error in the ambulatory care setting.[2–7] Investigations into the true incidence of these cases of "missed results" have demonstrated rates between 0.06% and 0.2% for missed abnormal laboratory test results and 2% for missed abnormal results of imaging studies.[3–5] While these rates may appear small, their impact becomes more clear when applied to actual numbers of annual tests performed in a health system. For example, these percentages would indicate that, of the roughly 9.2 million diagnostic tests (approximately 200,000 imaging studies and over nine million laboratory tests) completed in the VA Midwest Veterans Health Care Network (VISN 23) in 2005, anywhere between 9,000 and 22,000 may have shown clinically significant abnormalities that did not receive the appropriate clinical response.

One might argue that, since these rates for missed results were developed largely in private institutions, they might not be easily generalized to the VA, which uses one of the most sophisticated electronic medical records available.[8] It is true that the VA's computerized patient record system (CPRS) incorporates many features that have been proposed to help decrease errors related to missed results, such as diagnostic result reporting that is integrated with clinical notes, medication lists, future appointments, and diagnostic history.[6,7,9] Yet, even with this system in place, experience demonstrates that cases occur in which abnormal results are overlooked by the ordering clinicians and treatment is delayed. Why does this problem persist? What is the scope of the problem in VA institutions? And, most important, what can be done to decrease the burden of missed results?

In this article, we discuss how our VISN is tackling these issues. We describe the development of and findings from an investigation into VISN 23 results reporting that involved staff surveys and veterans focus groups. Next, using a model for analyzing the results management process found in the medical literature, we examine our VISN's procedures to tease out factors contributing to error. Finally, we summarize the recommended interventions—some of which we have begun implementing in VISN 23—and their potential impact on results reporting.

Dr. Wahls is the associate chief of staff at the VA Iowa City Health Care System (VA ICHCS); the hospital liaison and faculty member for the Institute for Translational Practice, Center for Research in the Implementation of Innovative Strategies in Practice, VA Health Services Research and Development Center of Excellence; and an associate professor of medicine in the division of general medicine, department of internal medicine, University of Iowa (UI) Carver College of Medicine; all in Iowa City, IA. **Dr. Haugen** is the director of the pathology and laboratory medicine service at the VA ICHCS and an associate professor in the department of pathology, UI Carver College of Medicine. **Ms. Cowell** is the laboratory manager at the VA Black Hills Health Care System, Fort Meade and Hot Springs, SD. **Dr. Becker** is the chief of staff at the VA Fargo Health Care System, Fargo, ND.

Continued on next page

Continued from previous page

DEVELOPING A VISN-WIDE QUALITY INITIATIVE

VISN 23 is a largely rural network covering North and South Dakota, Nebraska, Iowa, Minnesota, and western Wisconsin. It has many small, rural, community-based outpatient clinics and hospitals and several large, tertiary care, university-affiliated, teaching hospitals. Medical staff at these facilities are also diverse, including full-time, primary care VA practitioners; part-time, specialty staff; affiliated faculty with dual appointments in the local medical schools; and resident physicians.

In 2004, the VISN 23 Executive Leadership Council set as one of its strategic priorities the elimination of needless delays and waste due to missed test results. A multidisciplinary Results Reporting Task Force (RRTF) was created to lead this quality improvement initiative. The RRTF was asked to assess the current state of results reporting, identify major vulnerabilities, and recommend strategies for improvement that would be consistent with veteran preferences. In fulfilling these tasks and developing its recommendations, the RRTF decided to use staff surveys, veteran focus groups, and a review of medical literature on results reporting.

STAFF SURVEYS

To assess the current state of results reporting across VISN 23, the RRTF inserted two questions about test results management into an existing provider satisfaction survey conducted by the network. This was an anonymous, internet-based survey, for which invitations to participate were sent electronically to 737 physicians and mid-level providers in primary care, specialty medicine, and mental health in September 2005. The first of the two results management questions asked: "How satisfied are you with the process for reporting diagnostic test results back to your patients?" Respondents rated their satisfaction using a five-point Likert scale, in which 1 indicated the most favorable response. The second question instructed respondents to: "Select the response that best describes how you report diagnostic test results back to your patients." The response choices were: "all including normal results," "mostly all results including normal," "only abnormal result," "only abnormal results that require a change in therapy," "only critical results," "never report results," and "I don't order diagnostic tests."

In addition, the RRTF developed a brief, anonymous, internet-based survey that went into more specific detail about strategies for test results management, to be completed by both providers (physicians, nurse practitioners, and physician assistants) and nonproviders (supportive nursing, clerical, and administrative staff). For this survey, we used existing electronic mail groups to invite these individuals to participate. Primary and Specialty Medicine Service Line (PSMSL) groups were chosen because they request the bulk of the diagnostic services and because they have consistently maintained their mail listings. We also included Specialty Service Line (primarily surgical services) physician, nursing, and administrative leaders in order to incorporate some surgical perspectives and because these mail groups also were well maintained. In total, 370 invitations were sent: 245 to providers, 87 to nurses, and 38 to clerical and administrative staff.

The staff survey asked about the use of standard operating procedures (SOPs), the presence of residents or fellows in respondents' clinics (trainee clinics), and the management of results during the absence of the provider who had ordered the diagnostic study. In addition, as an indirect measure of the frequency with which patients cannot easily obtain their test results from the ordering service, providers only were asked how many patients they had encountered who had been redirected (by the ordering specialty service) to their clinic in order to find out their test results (known as "patient diversions").

SURVEY FINDINGS

Provider satisfaction survey

The provider satisfaction survey yielded 447 responses (59%) to the questions about results reporting. There was no significant variation according to the type of provider (mental health, specialty medicine, or primary care) for either of the two questions ($P > .5$).

The satisfaction level with current processes for results management was just above neutral at 3.43. Overall, 31% indicated they were dissatisfied with the current processes, and 4% indicated they were very dissatisfied.

Excluding those who said they do not order diagnostic tests, just over half of the providers indicated they generally report normal and abnormal results to patients, with 34% choosing the "all results" answer and 23% choosing the "mostly all results" answer (Figure 1). Among the other respondents, 21% indicated they report only abnormal results, 17% indicated they report only abnormal results that require a change in therapy, 3% indicated they report only critical results, and 1% indicated they never report results.

RRTF results management survey

On the RRTF results management survey, 143 (39%) of the 370 staff members contacted (providers and

Continued on page 27

Continued from page 24

nonproviders) responded to the first part of the survey. A similar response rate (42%) was seen among the 245 providers contacted for the second part of the survey.

On the first part of the survey, many respondents reported that their clinic had inadequate results management procedures in place. Approximately 60% of all respondents indicated that their clinic did not have an SOP in place for reporting test results. And, consistent with the provider satisfaction survey, approximately half of respondents to the RRTF survey indicated they routinely provided all test results to patients.

The management of results reporting during provider absences was variable, and we received a substantial number of "other" responses that described the use of surrogate assignment through CPRS. Accordingly, we reclassified the "other" responses into two broad categories of "CPRS-assigned surrogate" or "other" (nonsurrogate) procedure. In addition, because trainee clinics may experience different issues due to the infrequency with which they are held (typically every other week), we separated the findings from this survey question into respondents from trainee clinics and respondents from clinics with only VA staff (VA-staffed clinics).

The trainee clinic findings indicated that 21% of these clinics use an official sign-out procedure to assign diagnostic test reporting to other providers, 14% use a surrogate assignment in CPRS, and 3% use an other (nonsurrogate) procedure (Figure 2). The remainder of the respondents (62%) indicated that no official sign-out process took place. Specifically, 14% reported that the provider team monitors all results, 24% reported that nurses monitor the results that come in for the absent providers, 17% reported that patients must contact the clinic for results and have the clinic staff on service address their questions, and 7% reported that patients must contact the clinic for results and be redirected elsewhere (such as urgent care or primary care) to have questions answered.

When we examined survey responses from VA-staffed clinics, we found that, compared with trainee

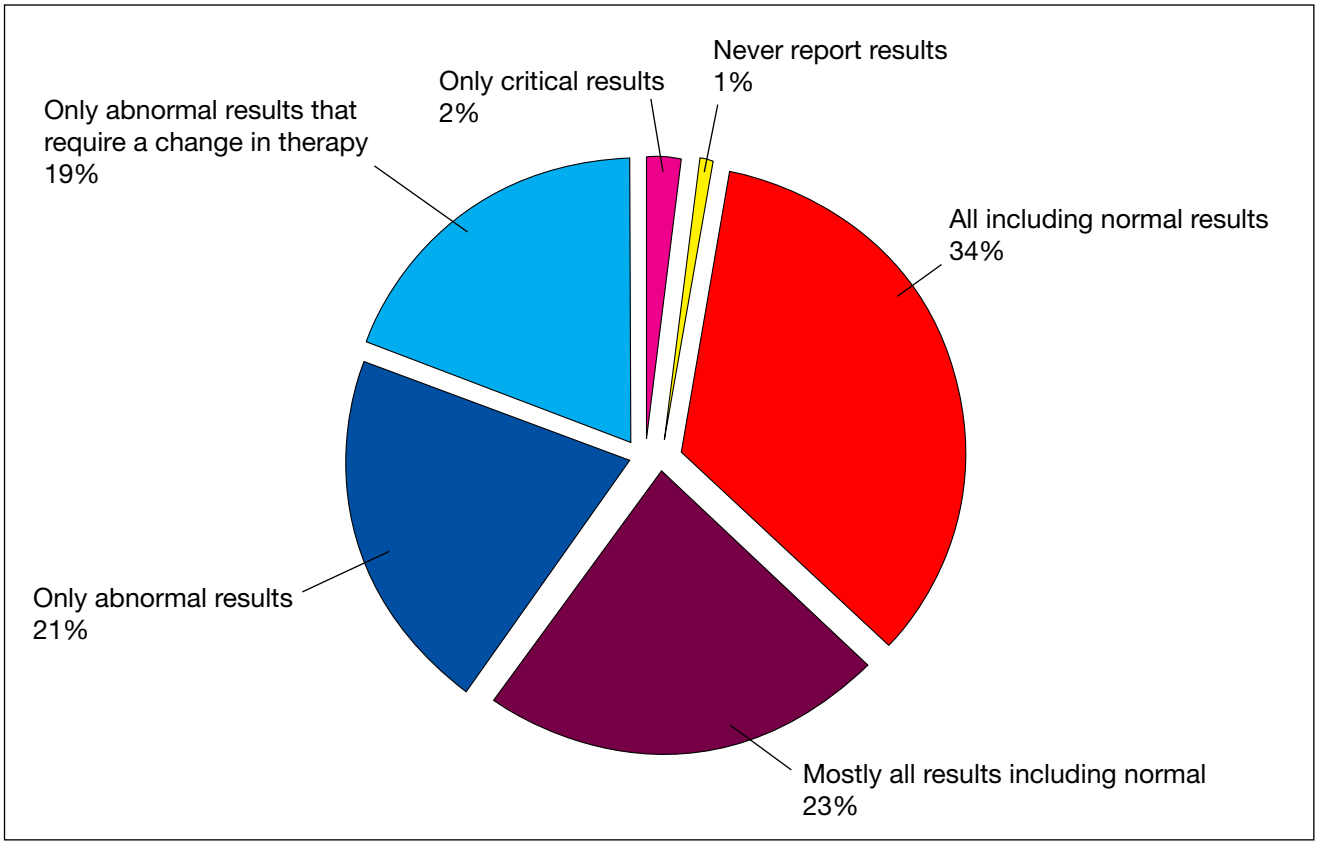

Figure 1. Findings from the provider satisfaction survey on the question of what type of results are typically reported back to patients.

Continued on page 29

Continued from page 27

clinics, they were more likely to use a surrogate assignment in CPRS (23%) or other (nonsurrogate) procedure (13%) and less likely to use an official sign-out procedure (8%) (Figure 3). That left 56% of respondents from VA-staffed clinics who indicated that no official sign-out process took place. Specifically, 29% reported that nurses monitor the results that come in for the absent providers, 25% reported that patients must contact the clinic for results and have the clinic staff on service address their questions, and 2% reported that patients must contact the clinic for results and be redirected elsewhere (such as urgent care or primary care) to have questions answered.

Among the providers who responded to the second portion of the survey, the majority (64%) indicated that they had encountered one or more patient diversions—for a total of 172 patient diversions. (This total was calculated using the mean of all responses.)

VETERAN FOCUS GROUPS

The RRTF also conducted focus groups with veteran patients and their families at the VA Iowa City Healthcare System, Iowa City, IA to investigate veteran experiences and preferences for notification of their test results. We generated the invitation list for participation in the focus groups using records of patient primary care appointments on the days the focus groups were scheduled to be held.

We conducted three focus group sessions with a total of 15 participants (three participants each in the first and second groups, and nine participants in the third group). During these sessions the veterans were asked open-ended questions about their current experiences, expectations, and preferences regarding how they receive information about test results. Veterans also were asked specifically about their comfort with the use of telephone-based secure messaging systems, MyHealtheVet (an internet-based communication tool developed by the VHA), letters from

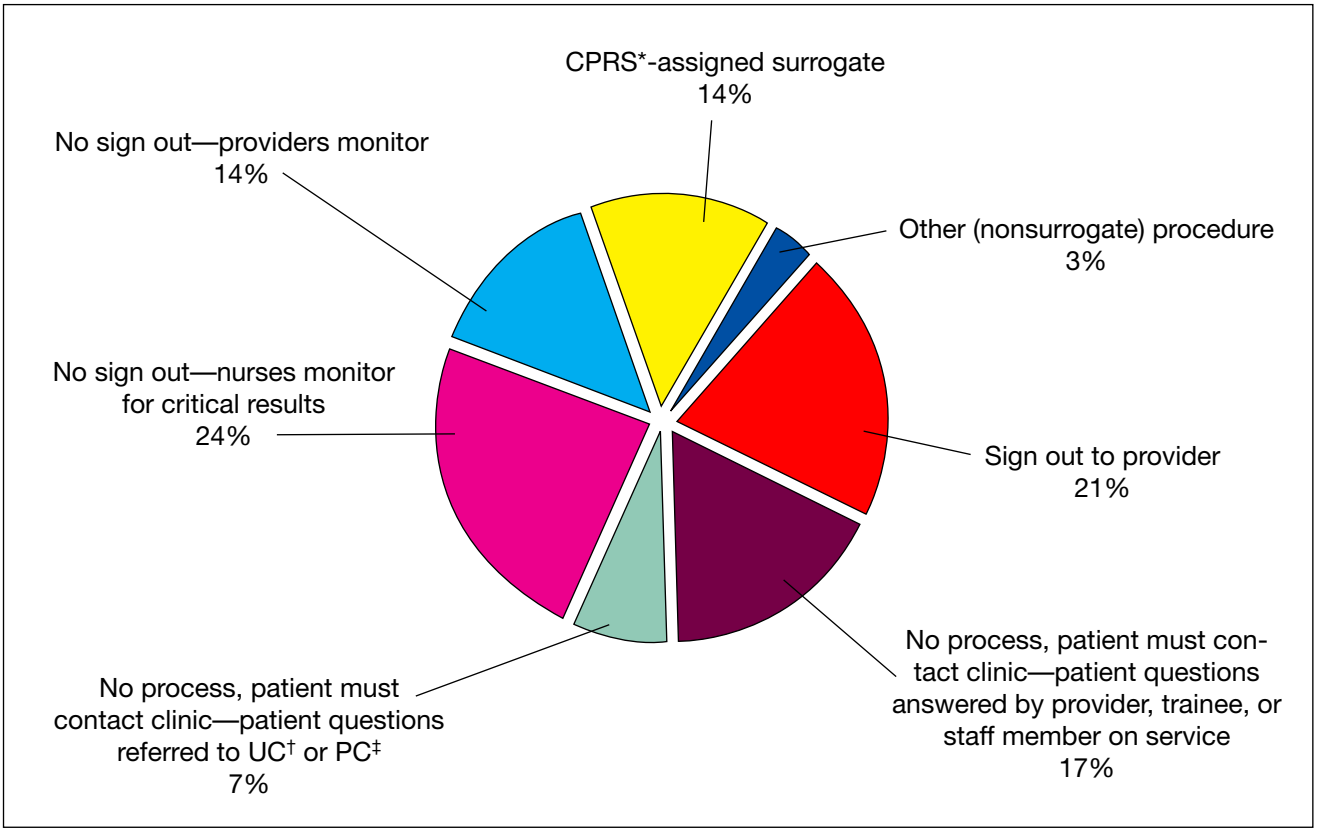

Figure 2. Findings in trainee clinics from the Results Reporting Task Force survey regarding procedures for managing results reporting in the absence of the ordering provider. *CPRS = computerized patient record system. †UC = urgent care. ‡PC = primary care.

providers, and receipt of copies of test results directly from the diagnostic service or from the medical records department.

Many veterans in the focus groups expressed that they did not routinely receive test results (Table). They further indicated a desire to be notified of all diagnostic test results. While the veterans generally indicated that telephone messages would be an acceptable means of communication if the test result was normal or if the veteran was relatively healthy, many stated a preference for having an official, written copy of the results for their files. These veterans specified that they would like to have this official copy either handed to them by their provider during their medical visit, sent from the provider in a follow-up letter, or mailed directly from the diagnostic service or medical records department. The veterans also expressed a strong interest in receiving information about their test results through a secure telephone messaging system or the VHA's My HealtheVet internet portal and in being notified automatically when an imaging study revealed a significant abnormality.

BREAKING DOWN THE PROCESS

Before taking steps to improve the procedures for results management in VISN 23, the RRTF undertook an analysis to improve our understanding of the underlying factors contributing to the overall problem. We selected the Hickner model, which breaks down the diagnostic test management process,[10] to guide our analysis. According to this model, the process is composed of three phases (preanalytic, analytic, and postanalytic), which can be broken down further into a series of six steps—beginning with the provider's decision to obtain a diagnostic test and culminating with the provider explaining to the patient how the test results affect the patient's health and medical care. Each step asks a vital question that relates to possible errors inherent in that part of the test management process.

- **Step 1: Is the right test ordered and implemented?** Because this step involves multiple actions

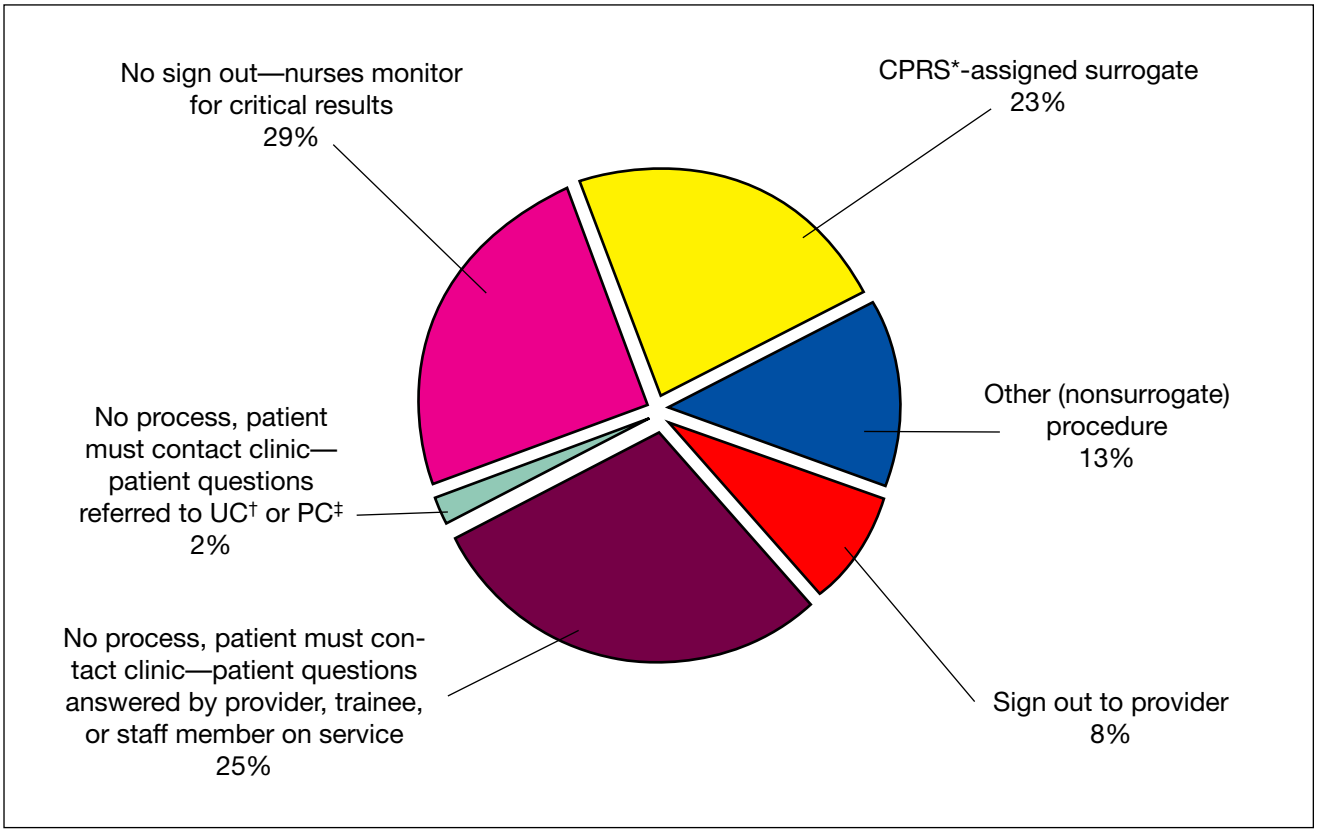

Figure 3. Findings in VA-staffed clinics from the Results Reporting Task Force survey regarding procedures for managing results reporting in the absence of the ordering provider. *CPRS = computerized patient record system. †UC = urgent care. ‡PC = primary care.

Table. Responses from veteran focus groups regarding results management

Topic	Focus group response	Example
Current result reporting	Half of the veterans indicated they generally did not receive notification of their test results. The most common strategy was reporting of abnormal results only.	Veterans said they most often were told, "I will call you only for problems."
Preferred results reporting strategy	The veterans expressed a desire to receive notification of all results, preferably in writing.	"If my medicines change, I need to have that in writing, for my other doctors...."
Telephone notification	Telephone results are acceptable for normal results, especially if the veteran is not taking chronic medication.	"If I am pretty healthy, on no medicines, a phone call is fine and easier…."
Copies of results	Veterans want their providers to explain their results in lay terms, but many also want official copies of the results—despite the technical medical language used in these documents.	"I want the copy of the report. I can take that to my doctor back home, or to other people in my family who can help me...."
Direct notification from diagnostic service	Veterans would like to be alerted of critical results by the diagnostic service, even if that alert might arrive ahead of any contact from their providers.	"…I want to get notified right away. It is OK if I get the letter ahead of my doctor, particularly if you tell me that you have been trying to reach me and that I should contact you if I have not already spoken with someone about this test…."
Other comments	Veterans expressed frustration that they are expected to deliver copies of medical notes from non-VA physicians when visiting a VA provider, yet they encounter difficulties getting copies of their results from the VA.	"…I bring official reports to you when I come to clinic; why do you hesitate to let me have official reports…?"

(the test is selected, ordered, and scheduled; the patient is notified and properly prepared for the test; and the patient follows through with the preparation instructions) taken by multiple individuals (providers, support staff, and patients) who must interact effectively, there are many points at which communication errors can occur, leading to a breakdown in the preanalytic process.[11,12] Given our survey results, which indicated that most VISN 23 clinics do not have SOPs in place for managing and reporting results, it is probable that those same clinics also lack SOPs guiding the ordering and scheduling of tests. Therefore, there is likely a significant risk of human error in our preanalytic phase of diagnostic testing.

- **Step 2: Is the diagnostic study completed correctly with reliable results?** Because an evaluation of the VISN 23 diagnostic services themselves was not included in the scope of our investigation, we chose not to address this step. For the purposes of this analysis, therefore, we presume that diagnostic services routinely complete the analytic phase within acceptable standard error rates.
- **Step 3: Are the results tracked and returned to the clinician?** This step requires effective tracking systems and some type of verification of provider review. Because of the integration of diagnostic services and clinical notes in CPRS, most test results are uploaded im-

Continued on page 34

Continued from page 31

mediately into the clinical record, making them instantaneously available to all clinicians. Specific electronic notification of the results occurs through "view alerts" that are sent to the ordering provider's inbox. Recognizing the possibility of notification overload, however, many VA facilities in VISN 23 have reduced greatly the number of mandatory notifications for their providers, giving providers control over their own notification settings. For example, providers might be allowed to choose between settings that would show them all diagnostic test results, abnormal results only, or mandatory (critical) results (the facility's clinical executive boards typically approve the definition of critical values as proposed by the diagnostic services). In addition, if alerts are not mandatory, CPRS cannot record provider review of the results with an electronic signature. Furthermore, in an effort to deal with information overload, providers often find ways to ignore even mandatory notifications in electronic medical record systems similar to the VA's CPRS.[7,9] As a result, despite the fact that the inclusion of a standard process for hand-off of clinical responsibilities between one provider and another is known to be an important safety feature of such systems,[13] considerable variation exists in the provider review processes, which in turn increases the risk of human error.

- **Step 4: Has the correct response to results been performed and documented in the medical record?** CPRS does not have a report that specifically tracks whether this crucial part of the process occurs. If an SOP were to guide documentation in CPRS, this step would be easier to monitor. At present, any documentation in the medical record occurs on a case-by-case basis.
- **Step 5: Was the patient notified of test results and the treatment plan?** Our staff survey results indicate that patient notification standards have not been developed and universally applied and that patient notification of test results is variable.
- **Step 6: Was the patient monitored through follow-up of the recommended treatment plan?** Again, VA clinical teams do not have access to a convenient method of tracking the recommended follow-up to ensure the patient completes subsequent diagnostic or treatment measures. Although care management functions within CPRS allow providers to create a report that identifies patients who've had a particular abnormal test result, use of this function has been restricted within VISN 23 due to the adverse impact that wide use has had on computer response time.

In summary, the existing systems configured within CPRS have neither mandated nor documented provider review of diagnostic test results. Also, while CPRS provides many useful tools for patient care, it has not guaranteed that all patients receive the appropriate clinical response to an abnormal test result. It's important to note that the capabilities within CPRS and other electronic medical record systems differ, and some of these issues may be addressed more fully in commercial systems. It's likely that subsequent releases of CPRS will address some of these concerns.

WORKING TOWARD A BETTER SYSTEM

Implementing SOPs

Based on the findings of the staff survey, veterans focus groups, and model analysis, the RRTF concluded that universal adoption of SOPs for results management is needed to guide communication during the preanalytic and postanalytic phases of diagnostic testing in VISN 23. This conclusion is supported by reports from the Institute of Medicine, which suggest that implementation of SOPs effectively reduces errors in multiple hospital settings.[14,15]

VA clinical teams do not have access to a convenient method of tracking the recommended follow-up to ensure the patient completes subsequent diagnostic or treatment measures.

Universal implementation of SOPs for results management throughout a multisite health care network like VISN 23 entails a major commitment on the part of clinical leaders, providers, support staff, and administrative staff. Additionally, significant reengineering of clinical and administrative processes would be required to ensure

Continued on page 37

Continued from page 34

consistent reporting of outpatient diagnostic tests to veterans. In reality, any increase in the use of SOPs in ambulatory clinics would have a major impact in reducing errors related to missed results. Therefore, the RRTF has undertaken steps to introduce results management SOPs into VISN 23 ambulatory clinics, with the eventual goal of universal implementation.

Recognizing that successful implementation of these SOPs would require strong clinical champions to succeed, our first step was to enlist the support of clinical leaders in the PSMSL. These leaders were recruited to assist in the development of recommended timeframes for patient notification and timelines for implementation and to define the roles of nurses in reporting results.

Once we had the endorsement of the PSMSL, we worked with the chief medical officer and the VISN clinical leaders to develop the draft "VISN 23 Policy for the Management and Reporting of Diagnostic Test Results to Outpatients." As the policy made its way through the approval process, it was modified to create a 14-month implementation timeline and to identify the specific high priority tests, such as cancer screening and diabetic surveillance tests, on which to place initial focus. At press time, the network director had signed the policy, and facilities had begun the process of initial pilot testing for local test result management and reporting strategies.

Monitors also have been identified to assess progress in the implementation of the new policy and its impact on health care. The commitment and enthusiasm of the clinical leaders, chiefs of staff, and facility directors will have the most immediate influence on the speed with which associated culture shifts and clinical practice changes take place.

Improving patient notification

The focus group responses indicated that many veterans prefer to have their tests completed prior to their clinic visit, to obtain official copies or summaries of their test results for their files, and to have a face-to-face review of these results with their providers. While this is possible for the vast majority of patients who are seen at VISN 23 parent facilities, it generally is impossible for those who are seen at the many community-based outpatient clinics, which usually send tests to the main facility for processing. Thus, at these clinics, test results typically are not available until the following day.

In a survey of internal medicine physicians, working in the private sector with a sophisticated electronic medical record system, researchers found that the physicians spent more than 74 minutes each day managing results and were frustrated by the absence of "provider-friendly" computer-generated result letters or monitoring systems.[7] In VISN 23, we have observed similar clinical concerns. An important strategy for the RRTF, therefore, has been collaboration with clinical services to develop more efficient tools for providers to create result summaries for clinic use and result letters to send to patients, with a minimal commitment of time.

In addition to making it easier for providers to give patients their test results, we believe that it's also important to help patients learn how to obtain copies of their test results. While allowing direct patient notification by the diagnostic services, or direct access to test results through a secure telephone messaging system, would ensure patient access to test results, setting up either of these notification systems would require a commitment of time and effort from the information resource management department. On the other hand, educating patients about how they can obtain their own clinical notes and test results from the Release of Information Office at their local facility or clinic does not require additional programming and, thus, may be easier to implement. It would seem, then, that the best options for improving patient notification of results in the immediate future are to work with clinicians to make patient notification easier (less time intensive) and to increase patient awareness of procedures available to them for obtaining copies of their results directly from their local Release of Information Office.

The RRTF concluded that universal adoption of SOPs for results management is needed to guide communication during the preanalytic and postanalytic phases of diagnostic testing.

Tracking and monitoring systems

In VISN 23, we currently lack an elegant method for tracking diag-

Continued on page 41

Continued from page 37

nostic tests and identifying when a patient with abnormal test results has not received an appropriate clinical response. CPRS has some capabilities for notifying providers of tasks that must be completed, but given individuals' limitations on processing large volumes of information, data filters are needed. These "smart monitors" would use potent filtering algorithms to monitor the diagnostic processes, facilitate appropriate care for the patients,[16,17] and alert providers only when it is necessary for them to make a clinical decision.

Until such smart monitors become available, it would be helpful to establish monitoring systems that would target certain diagnostic studies that are more likely to be missed, with consequential harm to patients. These studies might include anatomic pathology reports showing malignant or premalignant changes, imaging reports that raise suspicion of a possible malignancy or another unrecognized clinically significant abnormality, and other cancer screening diagnostics (such as elevated PSA values). Another option would be to use the query or report function within the Veterans Health Information Systems and Technology Architecture to identify specific abnormal test results that should be monitored for appropriate follow-up. Either approach requires programming time or individuals with sophisticated electronic skills to create and run the reports. The RRTF is working to develop and test "smart monitors" that can provide some of the above functions. In the interim, careful use of SOPs remains the best solution to ensure that diagnostic results have not been overlooked by clinicians.

In addition to tracking the tests as they are performed to prevent errors, there is also a need to monitor outcomes data to keep abreast of error rates and ensure continual improvement. In order to continually assess the issues related to results reporting, the RRTF conducts twice yearly, web-based provider surveys to track the types and frequency of both missed results and treatment delays encountered in primary care and to gain better understanding of provider perspectives on these issues. Furthermore, a question about patient receipt of test results has been added to the patient satisfaction surveys conducted each month within primary care. These measures are used to support the facility and VISN quality improvement teams and clinical services working to decrease the burden of diagnostic errors related to missed results.

Potential role of web initiatives

Increasingly, patients are taking an active role in their health care—which includes the maintenance of their own health files with copies of clinical notes and test results.[18] We observe this in the VA as more and more veterans choose to obtain copies of these documents through the Release of Information Office, often as a part of each clinic visit.

In response to this trend, the VA is building a comprehensive web portal, MyHealthₑVet (www.MyHealth.va.gov), to provide veterans with online access to their own clinical information. Already, this portal allows veterans to access their medication lists and request medication refills online. As a result, many veterans are registering with MyHealthₑVet and demonstrating the usefulness and effectiveness of these internet services in fulfilling veterans' needs.

When the MyHealthₑVet portal adds the capability for veterans to access copies of their clinical notes and diagnostic test results, as is planned for the future, we anticipate that VA results reporting will be transformed. Convenient access to these sources of health information is likely to serve as a powerful catalyst for rapid improvement and should decrease significantly the risk of delayed treatment due to missed results.

The authors report that the data presented in this article have been presented previously in abstract form at the July 2006 VA National Primary Care Conference, the April 2006 National Society of General Internal Medicine conference, and the February 2006 VA Health Services Research and Development conference. Furthermore, additional analyses of the data generated by the RRTF survey and their implications will be published in early 2007 in the Joint Commission Journal on Quality and Patient Safety.

The authors would like to acknowledge the hard work and dedication of the entire VISN 23 Results Reporting Task Force team, which includes representatives from imaging, pathology, laboratory, primary care, specialty care, nursing, administrative, information resource management, clinical applications coordinators, and decision support services. In addition to Dr. Wahls, Ms. Cowell, and Dr. Becker, this team is composed of: Sara Ackert, MA, health systems specialist; Mary Adams, RHIA, chief of health information management; Richard Baltaro, MD, staff pathologist (Nebraska); Barb Galbraith, RN, BA, program manager for clinical resource management (Sioux Falls); Pat Knebel, MS, chief medical technologist (Iowa City); Brian Neil, MD, staff physician (Minneapolis); Diana Page, BS, administrative officer (Sioux Falls); Dianne Petersen, BS, medical technology laboratory supervisor; John Reiffenberger, BS, RRT, clinical applications coordinator; Kathryn L. Sadewasser, BS, MT(ASCP); Shelly A. Stasiewicz,

RN, BSN, VISN 23 decision support services manager; Warren Sammuelson, BS, computer programmer analyst; Mary Shaw, MBA, operations manager, imaging; Mark Skugrud, BS, computer specialist; and Mike Streff, MBA, VISN 23 project manager.

The opinions expressed herein are those of the authors and do not necessarily reflect those of Federal Practitioner, *Quadrant HealthCom Inc., the U.S. government, or any of its agencies. This article may discuss unlabeled or investigational use of certain drugs. Please review complete prescribing information for specific drugs or drug combinations—including indications, contraindications, warnings, and adverse effects—before administering pharmacologic therapy to patients.*

REFERENCES

1. Harty-Golder B. Report results; avoid risk. *MLO Med Lab Obs*. 2004;36(5):42.
2. Roy CL, Poon EG, Karson AS, et al. Patient safety concerns arising from test results that return after hospital discharge. *Ann Intern Med*. 2005;143: 121–128.
3. Schiff GD, Aggarwal HC, Kumar S, McNutt RA. Prescribing potassium despite hyperkalemia: Medication errors uncovered by linking laboratory and pharmacy information systems. *Am J Med*. 2000;109:494–497.
4. Schiff GD, Kim S, Krosnjar N, et al. Missed hypothyroidism diagnosis uncovered by linking laboratory and pharmacy data. *Arch Intern Med*. 2005;165:574–577.
5. Cram P, Rosenthal GE, Ohsfeldt R, Wallace RB, Schlechte J, Schiff GD. Failure to recognize and act on abnormal test results: The case of screening bone densitometry. Jt *Comm J Qual Patient Saf*. 2005;31(2):90–97.
6. Boohaker EA, Ward RE, Uman JE, McCarthy BD. Patient notification and follow-up of abnormal test results: A physician survey. *Arch Intern Med*. 1996;156:327–333.
7. Poon EG, Gandhi TK, Sequist TD, Murff HJ, Karson AS, Bates DW. "I wish I had seen this test result earlier!": Dissatisfaction with test result management systems in primary care. *Arch Intern Med*. 2004;164:2223–2228.
8. Jha AK, Perlin JB, Kizer KW, Dudley RA. Effect of the transformation of the Veterans Affairs Health Care System on the quality of care. *N Engl J Med*. 2003;48:2218–2227.
9. Poon EG, Wang SJ, Gandhi TK, Bates DW, Kuperman GJ. Design and implementation of a comprehensive outpatient Results Manager. *J Biomed Inform*. 2003;36(1-2):80–89.
10. Hickner JM, Fernald DH, Harris DM, Poon EG, Elder NC, Mold JW. Issues and initiatives in the testing process in primary care physician offices. *Jt Comm J Qual Patient Saf*. 2005;31:81–89.
11. Kalra J. Medical errors: Impact on clinical laboratories and other critical areas. *Clin Biochem*. 2004;37:1052–1062.
12. Stankovic AK. The laboratory is a key partner in assuring patient safety. *Clin Lab Med*. 2004;24: 1023–1035.
13. Solet DJ, Norvell JM, Rutan GH, Frankel RM. Lost in translation: Challenges and opportunities in physician-to-physician communication during patient handoffs. *Acad Med*. 2005;80:1094–1099.
14. Kohn LT, Corrigan JM, Donaldson MS, eds. *To Err is Human: Building a Safer Health* System. Washington, DC: National Academy Press; 2000.
15. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press; 2001.
16. Bates DW, Gawande AA. Improving safety with information technology. *N Engl J Med*. 2003;348:2526–2534.
17. Burt CW, Hing E. Use of computerized clinical support systems in medical settings: United States, 2001–03. *Adv Data*. 2005;(353):1–8.
18. Cram P, Schlechte J, Rosenthal GE, Christensen AJ. Patient preference for being informed of their DXA scan results. *J Clin Densitom*. 2004;7:275–80.