

Safe Patient Outcomes Occur with Timely, Standardized Communication of Critical Values

ABSTRACT

A critical value is defined as an imminent life-threatening laboratory result requiring immediate physician notification. The concept was first introduced in 1972 and has been widely adopted as a standard of good laboratory practice. Regulatory agencies and federal legislation require that hospitals and laboratories establish a list of critical tests and values and have procedures in place for promptly conveying critical results to the responsible practitioner. Yet, despite the importance of critical values in patient care and requirements to identify and promptly communicate critical results to healthcare providers, there is little standardization of procedures. Communication of critical values has potential for failure, as illustrated in reports submitted to the Pennsylvania Patient Safety Authority and demonstrated in the medical literature. Standardization of processes related to critical tests, results, and values can positively affect quality of care and patient safety. First, facilities must develop a critical test list and identify critical values or results. Next, implementation of processes that identify critical values and mechanisms to quickly document and communicate critical values to healthcare providers caring for the patient may reduce harm to patients. (Pa Patient Saf Advis 2009 Sep;6[3]:93-7.)

From June 2004 through February 2009, the Pennsylvania Patient Safety Authority received nearly 1,000 reports involving critical tests and values. Failure of laboratory staff to communicate critical values to the responsible provider and failure to match results to the correct patient are the most common issues identified in the reports. Approximately 3% of these reports were identified as Serious Events that required additional interventions such as prolonged hospitalizations or increased lengths of stay in intensive care units (ICUs). Of the Serious Events, five patient deaths were reported. Almost 50% of the total reports were generated from the laboratory, with the remaining reports dispersed throughout care areas.

The issues associated with the critical values reports were poor communication, delays in treatment, and documentation issues. Analysis of current processes at a facility can determine what strategies (i.e., to identify, document, and communicate critical values) may be necessary to improve patient safety and quality of care, including strategies compliant with the Joint Commission 2009 National Patient Safety Goal (NPSG) related to critical values.

Background

The Joint Commission recognizes an explicit difference between critical tests and critical values. Facilities

need to establish a critical test list and a critical values list, also known as critical results. Critical tests are tests that always require immediate communication of the results, even if the results are normal.¹ Critical values are test results that are significantly outside the normal range and may represent life-threatening values.¹ The concept of critical values was first introduced by Lundberg in 1972. A critical value is a pathophysiological state at such variance with normal as to be life-threatening unless something is done promptly and for which some corrective action must be taken.^{2,3,4} It is a life-threatening situation requiring immediate intervention.^{2,3,5} In 1988, Congress enacted the Clinical Laboratory Improvement Act (CLIA), requiring laboratories to follow written procedures for reporting critical values.⁴ The College of American Pathologists (CAP) and the Joint Commission are accrediting agencies that survey laboratories to assure CLIA compliance, which includes establishing a list of critical values and results. Moreover, laboratories must have procedures in place for promptly passing on critical results to the responsible practitioner.^{2,6}

The critical values concept extends beyond laboratory tests, encompassing radiologic and other diagnostic tests and studies. The prompt communication of critical, life-threatening test results is crucial to reduce harm to patients. This article focuses on strategies to improve processes related to laboratory critical values. The same principles may be applied to radiology and other diagnostic departments. Specifically, development of a standardized list of critical radiology tests and results and methods to document and communicate the critical results promptly to healthcare providers may reduce harm to patients. The scope of this article will focus on laboratory tests.

Poor Communication Leads to Delays in Treatment

Although most clinical laboratory results have therapeutic implications that do not require urgent physician attention, some test results may indicate a potentially life-threatening situation. These critical results require immediate notification and action by the responsible licensed healthcare provider. This multifaceted process has potential for failure, as illustrated in reports submitted to the Authority. The most common errors identified are poor communication and delays in treatment related to critical values, which are consistent with themes in the literature of communication breakdown in reporting critical results. Specifically, 33% of reports related to critical lab values identified a failure of laboratory staff to report critical results to the responsible provider or a delay in reporting. In particular, the reports described

healthcare providers who did not receive notification about critical results and discovered the critical results by calling the laboratory or referring to the medical record. In the majority of cases, the laboratory totally failed to report the result and in other reports there was a significant delay in communicating the result directly to the healthcare provider. In the latter cases of delay in communication, several issues were identified, including the laboratory calling the wrong physician or the wrong number or the physician not responding in a timely manner. Additionally, some reports indicated failure by the recipient of the critical value to verify correct patient and correct result by means of the read-back process. The following Authority reports illustrate how such errors can result in patient harm:

The patient had blood drawn the day prior to the patient going to the cardiac catheterization laboratory. The catheterization laboratory nurse checked the patient's lab work prior to patient arriving to the [cardiac catheterization] lab, but the laboratory results reviewed were from a previous blood draw. According to the supervisor, there was a delay in lab work being sent to laboratory. While the patient was on the [cardiac catheterization] table, the patient became unresponsive, pulseless, and stopped breathing. Cardiopulmonary resuscitation (CPR) was initiated. The nurse checked the computer for lab work again. The critical result had been called to the nursing unit but had not been passed on to the catheterization staff. The potassium level was 6.8.

The critical hematocrit [laboratory value] was called to the wrong physician. An order for blood was obtained by the nurse. Blood transfusion started on patient who developed a reaction. The blood was stopped and the nurse called the physician, who at this point realized this was not his patient.

Blood work was drawn in the morning. There was a critical ammonia level of 352. Laboratory did not notify the nursing unit about the result. The critical value was available via computer in the afternoon but was not noted by the nurse until the night shift. The patient was unresponsive and pulseless. CPR was initiated, and the patient was transferred to the ICU.

Despite the importance of critical values in patient care and various regulatory agency requirements to identify and promptly communicate critical results to healthcare providers, there is little standardization of the process and procedures in organizations.² The development of a list of critical tests and results is established at individual organizations after discussion with representative groups of ordering providers. Establishment of communication processes is critical. For example, facilities may assign laboratory personnel to be responsible to communicate critical results. Likewise, facilities may determine the appropriate fixed time frame and the method of communicating the critical test result to the provider.

Barriers to Communication

Effective communication is defined by the Joint Commission as timely, accurate, complete, unambiguous, and understood by the recipient.⁷ Standardization of communication and documentation of critical results by the responsible provider may improve patient safety and quality of care. In 2003, the Joint Commission implemented NPSG 2C to improve the effectiveness of communication among caregivers.⁷ The goal includes implementation of a read-back process for taking verbal orders and standardization of abbreviations throughout the organization. Read-back helps to ensure that a message sent by a sender is understood by the receiver in the manner the sender intended. The sender sends a message, the receiver fully repeats the message as understood, and the sender acknowledges the message has been understood correctly.^{6,8} Some facilities require the recipient of the critical value perform a read-back of the value. Laboratory staff document the patient name, critical value, date and time communicated to the provider, and the provider's name who received the critical value and confirmation of the read-back process. In 2009, the Joint Commission expanded NPSG 2 to include defining critical tests, critical results, and values as described previously. In addition, Joint Commission included a requirement for organizations to identify and communicate critical tests and values in a timely manner and to measure, assess, and if needed, take action to improve the timeliness of reporting and the timeliness of receipt of critical tests and critical test results and values by the responsible licensed caregiver. Data from the Joint Commission, which includes surveys conducted from 2003 through the third quarter of 2007, indicates that NPSG 2C has the lowest compliance rate (36%) compared to the other NPSGs.⁹

Delays and inaccuracies in reporting critical values place patients at risk of harm due to treatment delays, omissions, and errors. The following Authority reports illustrate the range of communication problems resulting in errors:

Patient labs were drawn in the morning; critical blood sugar of 18 was not reported until five hours later.

Patient was admitted with fatigue. A laboratory test for a CBC [complete blood count] was drawn. [The results included] a white count of 0.7. This was not effectively communicated to the physician and went unnoticed until days later, at which point the patient was transferred to the hematology unit.

A patient [with] CHF [congestive heart failure] had blood work drawn [on admission]. No results were obtained until the next day [when] a critical potassium result of 6.4 was noted. Patient had been receiving potassium daily. No call was received on admission [for this critical result] and no printed lab report [was received] until the next day.

The unit clerk reported to the nurse and physician [a critical potassium level] of 2.2. The physician

wrote orders for potassium bolus and PO KCL [potassium chloride by mouth]. Both were given [promptly]. An hour later, the written lab results were received and the potassium was high and the phosphorus [level was] critically low at 2.1.

The report from the nurse included that the heparin 4,000 was titrated based on what was believed to be a partial thromboplastin time (PTT) [level of] 15. The patient was [given an intravenous] bolus of heparin and the heparin [drip] was increased. This titration was completed at [the end of the shift]. During report, we received a call from the lab with a critical high PTT of 180. The previous nurse had misread the PT (prothrombin time) as the PTT value. [The nurse] notified the on-call physician of the error and held the heparin [drip].

Patient evaluated with history of [cardiac and renal disease]. A critical potassium result of 8.5 was verbally communicated from nurse to the emergency department physician. Physician states he interpreted result as 5.8. [The lab reported the] specimen was slightly hemolyzed. No treatment was initiated. A repeat potassium level was 8.5. Treatment was ordered.

Identification of Critical Tests, Critical Results, and Values

There is little consensus or benchmark data about critical values in the clinical laboratory.³ The definition of a critical value remains unspecified in the minds of many clinicians and laboratory professionals. For example, data from 623 institutions participating in a CAP Q-Probe study indicated that critical value lists vary widely for routine chemistry and hematology laboratory tests.⁵ Facilities must establish a list of critical laboratory test values relevant to their daily operations and patient population. Ultimately, the medical director has the primary responsibility to establish a list that meets the needs of the organization it serves.⁴

Establish a List of Critical Tests, Critical Results, and Values

First, identify critical tests, critical results, and values that warrant prompt notification to a licensed healthcare professional at the facility level. Establish a multidisciplinary committee to develop the critical values test list.⁴ The Massachusetts Coalition for the Prevention of Medical Errors has created a starter set of critical results.⁷ According to Hanna, this list may stimulate discussion during the development of facility-specific lists.⁷ The CAP Q-Probes Committee does not endorse a national standard critical values list.⁴ However, improved safety and quality of care is enhanced with individualized lists. Consider the following components when establishing a facility-specific critical value list:

- Ensure committee representation from various departments, including the medical staff, laboratory staff, and nursing staff.⁴

- Customize the critical list as directed by the laboratory medical director, who has primary responsibility for the laboratory specimens list.⁴
- Consider the needs of special programs in the facility, such as cardiac surgery, bone marrow transplant, or high-risk obstetrics.⁴
- Post the critical laboratory test list in all areas of the laboratory.
- Review and revise the critical values list and related policies annually to maintain compliance with regulatory agencies.⁴
- Educate laboratory staff on the critical values list annually.⁴

Recognize and Notify of Critical Values

Next, develop and implement methods to guarantee that critical results from the approved list are recognized and communicated to the responsible provider and documented in the laboratory. Standardization of the process may promote the appropriate, prompt treatment of patients.

Recognition and notification of critical results begins in the laboratory. Laboratory staff should identify a critical value by strict semantic interpretation of the critical limits. For example, the upper limit for a potassium level is 5. If the result is 5.1, it is a critical value, but staff may not interpret one tenth of one point above as abnormal. Additionally, laboratory staff verifies that the sample of a critical lab value is satisfactory.⁴ Laboratories should set clear, realistic time frames to initiate and complete a critical value notification to enhance patient care.⁴ Healthcare facilities should implement processes of notification based on resources, technology, and personnel available.

Some facilities communicate critical results to the nurse caring for the patient, while others communicate critical results directly to medical staff by means of alphanumeric pagers.⁴ If available, laboratory information system (LIS) software can identify critical values and be integrated with telecommunication systems to deliver critical values directly to the physician's pager.⁴ Additionally, two-way pagers provide a method for physicians to acknowledge receipt of the critical value.⁴ An automated system provides high reliability of critical value notification.⁴ The use of LIS software may limit communication breakdowns such as those illustrated in Authority reports (e.g., unsuccessful attempts to notify responsible provider).

Furthermore, methods that identify a backup healthcare provider to be notified may improve notification of critical results.⁴ Identification of failure modes and implementation of strategies to prevent communication breakdown is essential. Establishing a process for the communication of critical values to the responsible provider improves timely treatment to patients.¹⁰

Additionally, implement policies and procedures that include the following strategies:

- Identify and assign staff to report critical results.⁴
- Establish a method for communicating the critical result. (The telephone and alphanumeric pager are reported to be the most effective methods to report critical values.)⁴
- Establish read-back policies appropriate to the communication method that require laboratory staff to ask and document the following elements from the recipient of the critical value: recipient first and last name, critical test and value, date and time, sender first and last name, and completion of read-back.
- Maintain an up-to-date directory of all relevant telephone and pager numbers in the laboratory.⁴
- Develop and implement backup systems to report critical test results for inpatients when the ordering provider is unavailable.^{6,11}
- Establish procedures to implement when an attempt to report a critical value to the ordering provider or backup provider fails. Follow the chain of command.⁴
- Document all critical value notifications. The documentation includes patient identification, laboratory test and result, date and time of notification, identity of reporter, and the recipient of the critical value.⁴
- Require recipients of critical results to read back the message for affirmation.⁶
- Identify methods for improving processes in reporting critical values.⁶
- Analyze and collect data to determine efficacy of notification to healthcare providers.⁶

Establish Time Frames for Reporting Critical Results

Not every critical test result needs to be reported with the same urgency.¹⁰ The Massachusetts Coalition for the Prevention of Medical Errors developed three categories (i.e., red, orange, yellow) with different time targets for communicating the result to the licensed healthcare worker. The goal is to ensure that results reach the provider and that treatment is initiated within an established appropriate time frame.¹⁰ The definitions of the categories are as follows:¹⁰

- *Red* signifies all test results that represent a clinical emergency that places a patient in imminent danger of death, or a significant adverse event unless treatment is initiated immediately. Notification within an hour is an appropriate time frame.
- *Orange* represents test results that require immediate notification to the physician and may occur during change of shift within six to eight hours.
- *Yellow* represents test results with significant abnormalities but do not pose an immediate threat to life. Notification of the result within three days is an appropriate time frame.

Verify Critical Results and Patient Treatment

- Verification of the critical result is the next step in the process. Actions taken by the recipient of the critical result and subsequent steps taken to ensure timely intervention is the key focus. Ideally, the primary physician receives the critical result and determines the need for treatment. If treatment is needed, the physician promptly instructs the nurse or other care provider to treat the critical value. The care provider or nurse provides the treatment, and the process is complete. However, difficulty contacting the responsible physician directly has resulted in facilities adopting a policy that permits the laboratory to convey the critical result to the registered nurse caring for the patient.¹² In this situation, the nurse must communicate the result accurately and promptly to the primary care physician. Research and experience indicates that each handoff communication increases the chance for error and miscommunication.¹² Implementation of the following strategies may enhance communication of critical results and improve timeliness of patient treatments. Identify and assign staff to receive critical results. The Joint Commission requires that critical results be reported promptly to a licensed provider or the practitioner who ordered the test.⁸
- Confirm correct patient name and critical test result by means of a read-back.⁶
- Use a standardized form (part of the medical record) to document all communications and interventions related to the critical value and critical result that includes patient identification, test result, date and time of notification, identity of reporter, and the recipient of the critical value.^{4,13}
- Also include in documentation the date and time the result was reported to the primary physician and time the patient received treatment, if indicated.^{6,13}
- Establish procedures to implement when an attempt to report a critical value fails to reach the primary licensed provider.⁴
- Initiate treatment promptly, if ordered, and document the time that the patient received the intervention.¹⁵
- Assess patient response to the intervention, and document in the medical record.

The process is complete when the patient receives treatment for the critical test result. However, maintain attentiveness and continue to monitor and assess the patient's response to treatment and subsequent laboratory testing related to the intervention.

Conclusion

Identification and notification of critical tests, values, and results is a complex process with potential for communication breakdown at every step. Implementation of the protocols presented here may improve

patient care and reduce harm. Ongoing evaluation and improvements in identifying and reporting critical tests, values, and results will lead to accurate notification from laboratory staff to the licensed professionals resulting in prompt treatment, if necessary, to patients.

Notes

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