LABORATORY MEDICINE Best Practices

Effective practices for the timely and accurate reporting of laboratory testing critical values

Through the Laboratory Medicine Best Practices (LMBP) Initiative, evidence-based evaluations are conducted to identify effective laboratory medicine practices associated with improved healthcare quality outcomes.

The LMBP Workgroup and Expert Panels provide guidance and subject matter expertise to the Centers for Disease Control and Prevention to complete these reviews.
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Rapid and accurate communication of critical laboratory test results is required by the Clinical Laboratory Improvement Amendments (CLIA) regulations; included in laboratory accreditation standards; noted as a National Patient Safety Goal; featured in the World Health Organization's World Alliance for Patient Safety; and codified in the International Organization for Standardization standards for medical laboratories. Improvement in critical value notification is driven by the assumption that timely reporting will lead to more timely clinical interventions with improved treatment outcomes and prevention of co-morbidities. The studies included in this review assessed the effectiveness of automated notification systems and call centers to improve the timeliness of critical values reporting.

Summary of LMBP™ Findings and Recommendations

The evidence supporting the use of call centers shows substantial and consistent results in improving the timeliness of critical value reporting in inpatient care settings, and the Laboratory Medicine Best Practices Workgroup recommends call centers as an "evidence-based best practice" for improving the timely reporting of critical values. The evidence, although suggestive, is not sufficient to make an LMBP recommendation for or against using automated notification systems as a best practice to improve the timeliness of critical value reporting in inpatient care settings.

About the Interventions and their Comparators

- **Automated notification systems** are automated alerting systems or computerized reminders using mobile phones, pagers, email or other personal electronic devices to alert the responsible healthcare provider(s) about laboratory test critical results. Upon receipt of an automated notification, the responsible provider acknowledges the critical test result and confirms the receipt of the alert. If the alert is not acknowledged within a specified timeframe, these systems typically revert to a manual notification system of the responsible and alternate providers.

    - Studies have contrasted the timeliness of automated notification systems' critical test result reporting with manual (typically, laboratory personnel) notification systems.

- **Call Centers** use a centralized unit for the communication of critical laboratory test results via telephone contact the responsible caregiver. If the responsible caregiver cannot be reached within a specified timeframe, call centers will attempt to reach alternative caregivers. Twenty percent of U.S. medical centers have reported using centralized call centers to communicate laboratory test critical results.[1]

    - Studies have contrasted timeliness of call centers' critical test result reporting with manual (typically, laboratory personnel) notification systems.

Results from the Systematic Reviews

A total of nine studies met the review inclusion criteria. The estimated effects for both automated notification systems and call centers consistently and substantially favor the tested practice. All studies reported positive and statistically significant effects with the exception of one low-powered automated notification study.

- Five studies assessed the improvement in timeliness of critical results communication associated with call center systems (2 published and 3 unpublished).
    - All call center studies were conducted in the United States
    - Results from four of the five studies reporting improvement in timeliness from implementing call centers could be standardized to a common metric. These results were generally criterion referenced (e.g., percent of critical results reported within 30 minutes), therefore findings were standardized using odds ratios (mean odds ratio (OR = 22.1; 95% CI=17.1–28.6).
        - Translating this result into a common language estimate, the time to report a randomly selected critical results using a call center will be faster than a randomly selected and manually reported critical results approximately 88.6% of the time.
    - The use of call centers may require additional communication with laboratory staff when a responsible caregiver requires additional information that call center staff are unable to provide. This situation may result in a delay of treatment while the appropriate laboratory staff member is located.
- Four published studies assessed the improvement in timeliness of critical results communication associated with automated notification systems.
    - These studies were conducted in the USA, Canada, South Korea, Italy, and the Republic of Singapore.

[1] Valenstein PN, W.E., Stankovic AK, Walsh MK, Schneider F., *Notification of critical results: a College of American Pathologists Q-Probes study of 121 institutions.* Arch Pathol Lab Med, 2008. 132(12): p. 1862-1867.

- Results from two of the four studies reporting improvement from implementing automated notification report could be standardized to a common metric. Meta-analysis of these results suggest that automated notification systems significantly improve timeliness (standard difference in means (d) = 0.42; 95% CI=0.2–0.62).
    - Translating this result into a common language estimate, the time to report a randomly selected critical result using an automated notification system will be faster than a randomly selected and manually reported critical value approximately 61.8% of the time.
- The electronic audit trail captured by automated notification systems may improve performance monitoring and evaluation. In addition, the development of automated notification systems has been observed to lead to a re-examination of critical results policies and thresholds.
- Automated notification systems may disrupt usual lines of communication, and may provide too much or too frequent information. The risk of losing back-up contact information must be properly anticipated. There are also risks for patient privacy violations, with protected health information being misdirected and/or mobile communication devices being accessible to unauthorized users.
- Automated notification systems require policies and procedures that mandate two-way communication and acknowledgment/confirmation of receipt. Policies for routing and escalation after unsuccessful notification attempts must be in place, and staff must remain proficient in the use of manual procedures when a technology failure occurs or escalation requires that laboratory staff revert to manual contacts.

These results are based on a systematic review of all available studies. This systematic review is supported by contract CB-11-214 from the Centers for Disease Control and Prevention. Battelle Memorial Institute provided administrative, research and technical support for this review along with input from a panel of subject matter experts in laboratory medicine and systematic reviews.

Supporting Materials

- Supplementary Data: Evidence summary tables & included studies
- Search strategy

Publications

Liebow EB, Derzon JH, Fontanesi J, Favoretto AM, Baetz RA, Shaw C, Thompson P, Mass D, Christenson R, Snyder SR, Epner P. Effectiveness of Automated Notification and Customer Service Call Centers for Timely and Accurate Reporting of Critical Values: A Laboratory Medicine Best Practices Systematic Review and Meta-Analysis. Clin Chem. 2012; 45(13-14):979-987.

Critical Values Clin Biochem 2012.pdf.

Disclaimer

The findings and conclusions are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry (CDC/ATSDR).

Sample Citation

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