Quick Guide for Improving Notification of Critical Laboratory Results in MOH Hospitals

A Project for Improving Patient Safety
STATEMENT OF INTENT

This Quick Guide was developed as part of the research project on Improving Notification of Critical Laboratory Results in MOH hospitals [NMRR-08-566-1721], a project for Improving Patient Safety. We hope the Quick Guide will assist hospitals to implement notification of critical laboratory results in medical laboratories and cascade to process in the ward.

The critical tests/values identified and the procedures delineated were compiled according to laboratory disciplines based on available evidence in the literature. Expert opinion from clinicians and laboratory staff in MOH hospitals was done using expert group discussions and the Delphi survey technique (Single Round).

The procedures suggested for use here addressed all of the recommendations advocated in Safe Practice Recommendations from the Massachusetts Coalition for Prevention of Medical Errors and the National Patient Safety Goals (Hanna et.al, 2005; Haverstick, 2004). The lists of tests and critical values as well as the procedure can be reviewed and revised as necessary according to individual laboratory needs.

REVIEW OF THE GUIDELINES

This was issued in February 2010 and may be reviewed if there is a need.

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The second goal of the International Patient Safety goals is for Effective Communication to improve patient safety. Laboratories play a crucial role here in notifying critical laboratory results to health care providers.

Critical values, defined as an imminent life threatening laboratory result requiring immediate physician notification, has been widely adopted as a standard of good laboratory practice worldwide. It is also mandated by accreditation bodies such as NATA, Australia and Standards Malaysia. In addition, poor communication is found to be the root cause of many incidents and medical errors. The Joint Commission on Accreditation of Hospital Organization (JCAHO) requires health care organizations to track and improve the timeliness of reporting and receipt of critical test results (Dighe et al., 2006; Centers for Medicare and Medicaid Services, 1992).

This Quick Guide lists critical results for selected tests/analytes and describes a procedure for notification that complies with the Safe Recommendations of the Massachusetts Coalition for Prevention of Medical Errors and the National Patient Safety Goals (Hanna et.al, 2005).

I hope that healthcare practitioners will translate the information in this Quick Guide into routine clinical practice and help make Ministry of Health hospitals a safer place for our patients.”

DR SHAHNAZ MURAD
The Head of Pathology Services

“A critical value as a result suggesting that the patient was in imminent danger unless appropriate therapy was initiated promptly”

“Reducing the rate of avoidable errors is crucial to patient safety. Telephone calls with misunderstood critical results constitute one area in which opportunities for improvement exist. The aviation industry has dealt with this issue by requiring pilots to repeat instructions received from the air traffic controller”
Joan Barenfanger, MD; Robert L. Sautter, PhD; Diane L. Lang, AS; MLT; Susan M. Collins, MT(ASCP); JC Donna M. Hoek, MT(ASCP); and Lance R. Peterson, Improving Patient Safety by Repeating (Read-Back) Telephone Reports of Critical Information. MLO Am J Clin Pathol. 2004;121:804-803
**DEFINITION**

**CRITICAL VALUE/RESULT**

Test result or value that falls outside the critical limits or the presence of any unexpected abnormal findings, cells or organisms which may cause imminent danger to the patient, and/or require immediate medical attention.

**CRITICAL LIMITS**

Boundaries of low and high laboratory test values beyond which may cause imminent danger to the patient and/or require immediate medical attention.

**Figure 1** The concept of lower and upper critical laboratory test results, illustrated using sodium as an example.
## Critical Limit for Chemical Pathology

### Values for Adults

<table>
<thead>
<tr>
<th>Lower Critical Limit</th>
<th>Analyte</th>
<th>Upper Critical Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 mmol/L</td>
<td>Potassium</td>
<td>6.0 mmol/L</td>
</tr>
<tr>
<td>125 mmol/L</td>
<td>Sodium</td>
<td>155 mmol/L</td>
</tr>
<tr>
<td>2.8 mmol/L</td>
<td>Glucose</td>
<td>20 mmol/L</td>
</tr>
<tr>
<td>1.5 mmol/L</td>
<td>Calcium</td>
<td>3.0 mmol/L</td>
</tr>
<tr>
<td>0.41 mmol/L</td>
<td>Magnesium</td>
<td>2.0 mmol/L</td>
</tr>
<tr>
<td>0.32 mmol/L</td>
<td>Phosphate</td>
<td>2.87 mmol/L</td>
</tr>
<tr>
<td></td>
<td>Lactate</td>
<td>5.0 mmol/L</td>
</tr>
<tr>
<td>7.2</td>
<td>pH</td>
<td>7.55</td>
</tr>
<tr>
<td>7.8 kPa</td>
<td>pO2</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>pCO2</td>
<td>9.3 kPa</td>
</tr>
<tr>
<td>250 mmol/kg</td>
<td>Serum Osmolality</td>
<td>350 mmol/kg</td>
</tr>
<tr>
<td></td>
<td>Creatine kinase</td>
<td>5000 U/L</td>
</tr>
<tr>
<td></td>
<td>Lithium</td>
<td>1.5 mmol/L</td>
</tr>
</tbody>
</table>

### Values for Pediatric

<table>
<thead>
<tr>
<th>Lower Critical Limit</th>
<th>Analyte</th>
<th>Upper Critical Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 mmol/L</td>
<td>Potassium</td>
<td>6.0 mmol/L</td>
</tr>
<tr>
<td>125 mmol/L</td>
<td>Sodium</td>
<td>155 mmol/L</td>
</tr>
<tr>
<td>1.6 mmol/L</td>
<td>CSF-Glucose</td>
<td>-</td>
</tr>
<tr>
<td>1.7 mmol/L</td>
<td>Calcium</td>
<td>3.1 mmol/L</td>
</tr>
<tr>
<td>0.5 mmol/L</td>
<td>Magnesium</td>
<td>1.8 mmol/L</td>
</tr>
<tr>
<td>0.4 mmol/L</td>
<td>Phosphate</td>
<td>2.8 mmol/L</td>
</tr>
<tr>
<td></td>
<td>Lactate</td>
<td>3.0 mmol/L</td>
</tr>
<tr>
<td></td>
<td>pH</td>
<td>7.60</td>
</tr>
<tr>
<td>5.85 kPa</td>
<td>pO2</td>
<td>16.2 kPa</td>
</tr>
<tr>
<td>2.6 kPa</td>
<td>pCO2</td>
<td>9.1 kPa</td>
</tr>
<tr>
<td>250 mmol/kg</td>
<td>Serum Osmolality</td>
<td>310 mmol/kg</td>
</tr>
<tr>
<td></td>
<td>Creatinine</td>
<td>330 µmol/L</td>
</tr>
<tr>
<td></td>
<td>Ammonia</td>
<td>100 µmol/L</td>
</tr>
<tr>
<td></td>
<td>Bilirubin</td>
<td>Neonate 513 µmol/L, Children 428 µmol/L</td>
</tr>
<tr>
<td></td>
<td>CSF-Protein</td>
<td>1.87 g/L</td>
</tr>
<tr>
<td></td>
<td>Urea</td>
<td>19.0 mmol/L</td>
</tr>
<tr>
<td></td>
<td>Uric Acid</td>
<td>500 µmol/L</td>
</tr>
</tbody>
</table>
LABORATORY PROCEDURE FOR NOTIFICATION OF CHEMICAL PATHOLOGY CRITICAL RESULTS

Laboratory performs test (routine/urgent/stat)

Who should be responsible?
PTMP
MLT/JTMLP
Science Officer
Medical Officer
Pathologist

Any CRITICAL LIMIT?

Refer critical value list

Verify the result

Check for common analytical interference

Check for pre-analytical, analytical & post analytical factor

Check record

From record book or LIS

Document the notification and relevant information into record book, LIS or standard notification

Inform result and ask for read back

Phone
Electronic
SMS
Manual dispatch

Staff nurse
Specialist
MO
Jururawat Masyarakat
Assistant MO

What to inform?

Informer name
Designation
Patient ID & location
Test name & result
Sample date & time

To whom?

How?

Same trend

Compare with previous result

Different trend

Repeat test
### Critical Limit for Haematology

#### Values for Adults

<table>
<thead>
<tr>
<th>Lower Critical Limit</th>
<th>Analyte</th>
<th>Upper Critical Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0 g/dL</td>
<td>Haemoglobin</td>
<td>19.0 g/dL</td>
</tr>
<tr>
<td>0.2</td>
<td>Hematocrit</td>
<td>0.6</td>
</tr>
<tr>
<td>20 x 10^3/μL</td>
<td>Platelet</td>
<td>1000 x 10^3/μL</td>
</tr>
<tr>
<td>100 mg/dL</td>
<td>Fibrinogen</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>INR (Ratio)</td>
<td>&gt;5</td>
</tr>
<tr>
<td>-</td>
<td>PT (sec)</td>
<td>&gt;2.5 upper limit</td>
</tr>
<tr>
<td>-</td>
<td>APTT (sec)</td>
<td>80 sec or &gt;2 x upper reference range</td>
</tr>
</tbody>
</table>

#### Values for Paediatric

<table>
<thead>
<tr>
<th>Lower Critical Limit</th>
<th>Analyte</th>
<th>Upper Critical Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0 g/dL</td>
<td>Haemoglobin (Paeds)</td>
<td>20.0 g/dL</td>
</tr>
<tr>
<td>8.0 g/dL</td>
<td>Haemoglobin (Neonate)</td>
<td>22.0 g/dL</td>
</tr>
<tr>
<td>0.20</td>
<td>Hematocrit (Paeds)</td>
<td>0.40</td>
</tr>
<tr>
<td>0.25</td>
<td>Hematocrit (Neonate)</td>
<td>0.70</td>
</tr>
<tr>
<td>50 x 10^3/μL</td>
<td>Platelet</td>
<td>1000 x 10^3/μL</td>
</tr>
<tr>
<td>70 mg/dL</td>
<td>Fibrinogen</td>
<td>-</td>
</tr>
<tr>
<td>70 mg/dL</td>
<td>INR (Ratio)</td>
<td>&gt;5</td>
</tr>
<tr>
<td>2.0 x 10^3/μL</td>
<td>WBC</td>
<td>50 x 10^3/μL</td>
</tr>
</tbody>
</table>
LABORATORY PROCEDURE FOR NOTIFICATION OF HEMATOLOGY CRITICAL RESULTS

Who should be responsible?
- PTMP
- MLT/JTMP
- Science Officer
- Medical Officer
- Pathologist

Laboratory performs test (routine/urgent/stat)

Any CRITICAL LIMIT?
Refer critical value list

Verify the result
Check for common analytical interference
Check for pre-analytical, analytical & post analytical factor

Check record
From record book or LIS

Dispatch a copy of the result

Document the notification and relevant information into record book, LIS or standard notification

Inform result and ask for read back
Phone
Electronic
SMS
Manual dispatch

Check for trends
Same trend
Compare with previous result
Different trend
Repeat test

Record:
- Informer name & designation
- Patient ID & ward name
- Test name & result
- Sample date & time
- Recipient name
<table>
<thead>
<tr>
<th>Test</th>
<th>Critical Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrospinal fluid Culture &amp; Sensitivity</td>
<td>Microscopy result (Normal or abnormal)</td>
</tr>
<tr>
<td>Cerebrospinal fluid Antigen detection</td>
<td>Positive rapid antigen detection</td>
</tr>
<tr>
<td>Blood culture</td>
<td>Positive result from gram stain or / and culture</td>
</tr>
<tr>
<td>Sterile body fluids</td>
<td>Positive result from Gram stain or culture</td>
</tr>
<tr>
<td>Acid Fast Bacilli</td>
<td>Positive smear result or / and culture</td>
</tr>
<tr>
<td>Malaria Parasite on blood film</td>
<td>Presence of malaria parasite</td>
</tr>
<tr>
<td>Stool culture</td>
<td>Salmonella typhi, Vibrio cholerae, Shigella</td>
</tr>
<tr>
<td>Any type culture</td>
<td>ESBLs producer organism, MRSA, Multi-Resistant Organism (MRO), VRE, VRSA</td>
</tr>
<tr>
<td>Antigen detection</td>
<td>Legionella spp</td>
</tr>
<tr>
<td>Pernasal swab</td>
<td>Bordetella Pertussis, Corynebacterium diptheria</td>
</tr>
</tbody>
</table>
LABORATORY PROCEDURE FOR NOTIFICATION OF MICROBIOLOGY CRITICAL FINDINGS

Who should be responsible?
- PTMP
- MLT/JTMP
- Science Officer
- Medical Officer
- Pathologist

Laboratory performs test (routine/urgent/stat)

Who should be responsible?
- PTMP
- MLT/JTMP
- Science Officer
- Medical Officer
- Pathologist

Any CRITICAL LIMIT?
- Refer Microbiology critical findings list

Verify patient ID on the request form, specimen container/slide/culture plate
- Check for sample error & labelling error

Check process in the lab
- Check for analytical error: microscopic, culture, biochemical result

Repeat test

Clinical info

Any discrepancy?
- Yes
- No

Document the notification and relevant information into record book, LIS or standard notification

Inform result and ask for read back

Check records
- From record book or LIS

Same trend

Different trend

Repeat test

Record:
- Informer name & designation
- Patient ID & ward name
- Test name & result
- Sample date & time
- Recipient name
- Read back done

Informer name:
- Designation
- Patient ID & location
- Test name & result
- Sample date & time

To whom?
- Staff nurse
- Specialist
- MO
- Jururawat Masyarakat
- Assistant MO
<table>
<thead>
<tr>
<th>Test</th>
<th>Critical Findings</th>
</tr>
</thead>
</table>
| Unexpected or discrepant Findings                                   | Unexpected malignancy  
Wrong organ removed                                                             |
| Reports of infections                                               | Bacteria in heart valves or bone marrow  
Organisms in an immune-compromised patient such as AFB, fungi, viral, protozoa |
|                                                                     | Organisms in Cerebrospinal Fluid (CSF)                                            |
|                                                                     | Unusual organisms or organism in unusual sites e.g. amoeba in the eye             |
| Reports on critically ill patients requiring immediate therapy      | Crescents in greater than 50% of glomeruli in renal biopsy specimen  
Transplant rejections                                                |
| Cases that have immediate clinical consequences                    | Fat in an endometrial curettage  
Mesothelial cells in a heart biopsy  
Fat in snare colon biopsy specimens                                   |
LABORATORY PROCEDURE FOR NOTIFICATION OF ANATOMICAL PATHOLOGY CRITICAL FINDINGS

1. Laboratory performs test (routine/urgent/stat)

2. Any CRITICAL LIMIT?
   - Refer Anatomical Pathology critical findings list

3. Verify patient ID on the request form, specimen container
   - Check for discrepancy & transcription error

4. Check process in the lab
   - Check: Demography, grossing, sectioning, staining and labelling of slides

5. Dispatch a copy of the result

6. Document the notification and relevant information into record book, LIS or standard notification
   - Record: Informer name & designation, Patient ID & ward name, Test name & result, Sample date & time, Recipient name, Read back done

7. Inform result and ask for read back
   - Phone, Electronic, SMS, Manual dispatch
   - To whom?
   - What to inform?
   - Informer name, Designation, Patient ID & location, Test name & result, Sample date & time
WARD/CLINIC PROCEDURE FOR NOTIFICATION OF LABORATORY CRITICAL RESULTS

Ward staff receives critical result notification from lab

- Verbally (Phone)
- Electronic alert (THIS)
- Manual dispatch of result
- SMS
- E-mail

Record information received

In:
- Standard form
- Patient case note (immediately done)
- BHT for in-BHT
- Other s: i.e. stamp

What to record?
- Patient name
- Patient R/N, ID
- Test name and result
- Sample date and time
- Date & time of notification
- Name of recipient

Read back the information received

To read back:
- Patient name & ID
- Test name & result

If patient transferred out to another ward

Recipient or S/N in charge inform/forward to staff in another ward

If patient has been discharged

MO/specialist in charge will decide:
- Call back patient to ward/clinic.
- Bring forward appointment date.
- Call patient for earlier appointment

Inform doctor immediately

Contact the doctor in charge immediately

Record in nursing notes/nursing care plan/BHT

Attach result in BHT

Medical Attention by doctor in charge

The doctor has to sign on the result slip. Write the plan of management in patient's BHT

Responsible Staff:
- Staff nurse in charge
- Medical assistant
- HO
- MO
- Specialist
REFERENCES


