Laboratory Quality Metrics

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Learning Objectives

- Define how to plan, develop and implement quality metrics / indicators in your laboratory
- List the most common quality indicators used in the clinical laboratory
- Understands how to go about selecting KPIs and the various caveats that you have to consider
- Explain how to develop quality indicators for multiple laboratories
Quality of Care

“the degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” — IOM

Institute of Medicine Committee to design a strategy for quality review and assurance in Medicare. National Academic Press; 1990.

Accurate and efficient clinical laboratory testing is a critical component to high-quality patient care.
Quality Metric / Indicator

“Systemic measurement process intended to provide information about the quality of a system”


“Measurement (metric) to monitor specific activities as part of the quality management system”

Clinical & Laboratory Standards Institute (CLSI)- GP 35-A

By incorporating quality metrics, laboratories find, address and solve issues early on rather than waiting till after the fact to determine that a given process is not meeting quality specifications.
PDCA Cycle - CHECK
What are the Critical Health Care Quality Domains? (IOM)

1. **Safety**: Not harming people from care.
2. **Effectiveness**: Matching scientific evidence to care.
3. **Patient-centeredness**: Put patients in control of their own care.
4. **Timeliness**: Avoiding non-instrumental delays.
5. **Efficiency**: Avoiding waste, duplication of care.

IOM
TTP or The “Brain-to-Brain Loop”
Quality Indicators in Laboratory Medicine: Why?

- Performance and outcome measures
  - Improve quality of patient care
  - Enforce accountability
  - Enable the comparison between providers

Planning / Selection of the KPIs

- Regulatory requirements (e.g. HAAD)
- Accreditation requirements (e.g. ISO, CAP, CPA, etc..)
- QM Plan (12 QSE)
- Customer concerns
- IOM quality dimensions (Safety, effectiveness, patient-centered..)
- TTP
  - Pre-examination, examination & post-examination
  - Operational, Financial, HR, Quality & patient safety
  - Operational units (POCT, Hematology, AP, etc..)
- Patient / outcome
Criteria for Quality Indicators

- Importance
- Scientific soundness
- Feasibility
- Timeliness
- Appropriateness
Examples of Laboratory KPIs
Pre-examination

- Accuracy of patient identification
- Appropriateness of sample container
- Blood culture contamination rate
- Correct sample labeling (mislabeled, unlabeled)
- Identification of inpatients not wearing wristbands
- Number of unsatisfactory cervicovaginal cytology samples
- Phlebotomy success
- Requisition monitoring for correct ordering
- Sample integrity
- Sample quantity
- Urine culture contamination rate

Examination

- Cervical cytology/biopsy correlation
- Competency of personnel
- Concordance for surgical pathology cases reviewed elsewhere
- Correlation of fine-needle biopsy diagnoses
- External quality assessment (EQA)
- Frozen section discordance
- Investigation of examination failures
- Laboratory injuries or accidents

Post Examination

- Auto-verification errors
- Consistency of critical values reporting
- Critical value reporting
- Major corrections to surgical pathology reports
- Proportion of corrected reports
- Report delivery turnaround time

Post-Examination / Turnaround Time

- Turn around time for cardiac injury markers
- Compliance with internal turnaround time standards
- Cytology turnaround time
- Frozen section turnaround time

- System:
  - Cost/benefit ratio
  - Customer satisfaction
  - Diabetes monitoring
  - Patient’s satisfaction

Other

- Antimicrobial susceptibility trends
- Blood bank errors as reportable to a regulatory agency
- Blood product wastage rate
- Prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA)
- Review of previous negative Pap smears in cases of new abnormal Pap smears
- Surgical pathology report review for necessary data

Development of the KPIs

**Develop operational definition**
Name, purpose, scope, authority, domain

**Develop data collection and analysis strategy**
Nominator, Denominator, who collects the data, frequency, calculations, presentation, etc..

**Set targets, limits, or action threshold**
International bench mark, organizational performance goal, feasibility, current performance, evidence based
**PERFORMANCE INDICATOR:**
Turn around Time for STAT Potassium orders

<table>
<thead>
<tr>
<th>Year:</th>
<th>XXXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dept/Area:</td>
<td>Laboratory</td>
</tr>
<tr>
<td>Numerator =</td>
<td>Total number of STAT Potassium orders from all locations which exceed a TAT of 1 hour from sample receipt in the laboratory to result verification.</td>
</tr>
<tr>
<td>Denominator =</td>
<td>Total number of STAT Potassium orders from all locations.</td>
</tr>
<tr>
<td>Included Population:</td>
<td>All STAT Potassium orders from all locations.</td>
</tr>
<tr>
<td>Excluded Population:</td>
<td>All orders for tests other than Potassium and all Potassium orders with priority other than STAT.</td>
</tr>
<tr>
<td>Data Source:</td>
<td>Computer generated requests.</td>
</tr>
<tr>
<td>Benchmark Value:</td>
<td>TAT for STAT Potassium orders exceeding 1 hour should be &lt;5%.</td>
</tr>
<tr>
<td>Benchmark Source:</td>
<td>College of American Pathologist- Q- TRACK</td>
</tr>
<tr>
<td>Reporting Cycle:</td>
<td>Monthly</td>
</tr>
<tr>
<td>Responsible person:</td>
<td>XYZ</td>
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</table>

### Monthly Results

<table>
<thead>
<tr>
<th>Month</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>YTD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result:</td>
<td>3%</td>
<td>3%</td>
<td>4%</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4%</td>
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<tr>
<td>Numerator</td>
<td>80</td>
<td>109</td>
<td>164</td>
<td>201</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td>55400%</td>
</tr>
<tr>
<td>Denominator</td>
<td>2513</td>
<td>4227</td>
<td>4591</td>
<td>4237</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>1556800%</td>
</tr>
<tr>
<td>Quarterly Summary:</td>
<td>3%</td>
<td></td>
<td>5%</td>
<td></td>
<td>#DIV/0!</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target value =</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Analysis and Action Steps

<table>
<thead>
<tr>
<th>Date</th>
<th>Analysis and Action Steps</th>
<th>Responsible Person</th>
<th>Expected Completion Date</th>
<th>Barriers Encountered</th>
<th>Date Completed or Status**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>
Development of Quality Indicators for Multiple Laboratories

- Based on patient or health care system outcome
- Choose the highest priority metrics
- Define the measurement and the benchmark
- Obtain feedback from stakeholders (physicians, administrators)
- Ensure:
  - Applicability across
  - Uniformity of definitions and data collection
  - Heterogeneity (quality, operational, financial, etc..)

*Clinical and Laboratory Standards Institute (CLSI)- GP-35-A*
Development of Quality Indicators for Multiple Laboratories- PLMS Experience

Clinical Chemistry / Laboratory Medicine Quality Indicators

Laboratory Medicine Quality Indicators
A Review of the Literature

Shahram Shahangian, PhD, MS, and Susan R. Snyder, PhD, MBA

Quality Indicators Review *

- AHRQ National Healthcare Quality Report
- College of American Pathologists (CAP)
- NCQA (National Committee for Quality Assurance) information set measures
- AHRQ-sponsored US Preventive Services Task Force
- CDC (Center for disease control) — sponsored US task force on community preventive services
- PubMed data base search

Quality Indicators Selection Criteria *

1. The use of quantitative measure associated with laboratory testing or services

2. Has the potential to be linked to at least one IOM health care domains

- 14 QIs identified
- Spanning 6 stages of the TTP

<table>
<thead>
<tr>
<th>Stage</th>
<th>IOM Domains</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Test Ordering</strong>&lt;br&gt;• Test order appropriateness</td>
<td>Effectiveness, efficiency &amp; timeliness</td>
</tr>
<tr>
<td><strong>2. Patient Identification / Specimen collection</strong>&lt;br&gt;• Inpatient wristband identification error&lt;br&gt;• Patient satisfaction with phlebotomy</td>
<td>Safety&lt;br&gt;Patient-centeredness</td>
</tr>
<tr>
<td><strong>3. Specimen ID, preparation &amp; transport</strong>&lt;br&gt;• Specimen rejection&lt;br&gt;• Blood culture contamination&lt;br&gt;• Specimen container error</td>
<td>Effectiveness, efficiency, safety &amp; timeliness&lt;br&gt;Efficiency &amp; safety&lt;br&gt;Efficiency &amp; safety</td>
</tr>
<tr>
<td><strong>4. Analysis</strong>&lt;br&gt;• PT performance&lt;br&gt;• Gyne cytology – biopsy discrepancy</td>
<td>Safety&lt;br&gt;Effectiveness, efficiency, safety</td>
</tr>
<tr>
<td>Stage</td>
<td>IOM Domains</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td><strong>5. Result reporting</strong></td>
<td>Patient – centeredness, timeliness</td>
</tr>
<tr>
<td>• Inpatient lab result availability</td>
<td>Efficiency, safety</td>
</tr>
<tr>
<td>• Corrected reports</td>
<td>Safety, timeliness</td>
</tr>
<tr>
<td>• Critical values</td>
<td>Timeliness</td>
</tr>
<tr>
<td>• TAT</td>
<td>Effectiveness, timeliness</td>
</tr>
<tr>
<td>• Clinician satisfaction with lab services</td>
<td></td>
</tr>
<tr>
<td><strong>6. Result interpretation &amp; ensuing action</strong></td>
<td>Effectiveness, timeliness</td>
</tr>
<tr>
<td>• Follow – up of abnormal cervical cytology results</td>
<td></td>
</tr>
</tbody>
</table>
Laboratory Quality Metrics

The Evidence
Result Reporting

- **Turnaround Time (TAT)**

**Evidence Base:**

- ↓ *LOS in ED for certain conditions*
- *POCT has been associated with effective reduction in TAT*
- *TAT for cardiac markers in the ED??*

*Shahram & Snyder. Am J Clin Pathol 2009;131:418 - 431*
Door-to-Balloon Time and Mortality among Patients Undergoing Primary PCI

Daniel S. Menees, M.D., Eric D. Peterson, M.D., Yongfei Wang, M.S., Jeptha P. Curtis, M.D., John C. Messenger, M.D., John S. Rumsfeld, M.D., Ph.D., and Hitinder S. Gurm, M.B., B.S.
Figure 1. Door-to-Balloon Times and Mortality in the Overall Population and High-Risk Subgroups, 2005 to 2009.
Test Ordering

- Test Order Appropriateness

Evidence Base:
- LOS: (↓ few studies - No change, most studies)
- Cost saving: (↓ inappropriately ordered tests)
- May have a negative impact in certain conditions

Potential for improvement:
- Promotion of guidelines + education
- Electronic decision support system
- Linking physicians to EMR

*Shahram & Snyder. Am J Clin Pathol 2009;131:418 - 431*
<table>
<thead>
<tr>
<th>Disease/Condition</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemia</td>
<td>CMS (2004)</td>
</tr>
<tr>
<td>Chlamydia infection</td>
<td>NCQA (2005), USPSTF (2008)</td>
</tr>
<tr>
<td>Lead poisoning</td>
<td>Wisconsin Department of Health (2006)</td>
</tr>
<tr>
<td>Renal disease</td>
<td>CMS (2005), Renal Physicians Association (2002)</td>
</tr>
<tr>
<td>Upper respiratory infection</td>
<td>ICSI (2003), NCQA (2006)</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>ICSI (2004)</td>
</tr>
<tr>
<td>Venous thromboembolism</td>
<td>ICSI (2006)</td>
</tr>
</tbody>
</table>

BMA, British Medical Association; CDC, Centers for Disease Control and Prevention; CMS, Centers for Medicare & Medicaid Services; ICSI, Institute for Clinical Systems Improvement; NCQA, National Committee for Quality Assurance; PCPI, Physician Consortium for Performance Improvement; USPSTF, US Preventive Services Task Force; VHA, Veterans Health Administration.
Patient Identification

- Inpatient wristband identification errors

Evidence Base:

- In transfusion medicine
- No published studies on effective interventions
- Evidence that effective monitoring ↓ patient misidentification during phlebotomy

Potential for improvement:

- Evidence that effective monitoring ↓ patient misidentification during phlebotomy

*Shahram & Snyder. Am J Clin Pathol 2009;131:418 - 431*
Patient Identification*

*Q-Tracks study. Arch Pathol Lab Med 2002
Specimen Collection & Transport

- Specimen Rejection Rate

Evidence Base:
- No study relating it to outcomes
- Non lab personnel were 2 – 4 times more likely associated with higher rejection rates
- Use of QI monitor did not result in better performance

*Shahram & Snyder. Am J Clin Pathol 2009;131:418 - 431*
Specimen Collection & Transport

- Blood Culture Contamination Rate

Evidence Base:
- Cost:
  - ↑LOS (13.9 vs 5.5 days)
  - Antibiotics ($10,500 vs $4,200)
  - Unnecessary repeated test
- Long – term monitoring & use of dedicated phlebotomy team are associated with ↓blood culture contamination
- No other studies linking it to other clinical healthcare outcome

*Shahram & Snyder. Am J Clin Pathol 2009;131:418 - 431*
Analysis

- **PT Performance**

**Evidence Base:**

- PT failure rate ↓ with increased experience performing PT
- PT performance correlated positively with performance of blind PT
- No direct evidence that improved PT performance positively impacts actual test performance or other outcome!!

*Shahram & Snyder. Am J Clin Pathol 2009;131:418 - 431*
Result Reporting

• Critical value notification

Evidence Base:

• No studies relating this indicator to any outcome
• Review of medical records → change in therapy in 65% of cases
• Interviews with medical staff → 95% valuable to patient care

Laboratory Quality Metrics

The Gaps
Gaps in current Laboratory PIs

- Lack of evidence base for some of the indicators
- Focus on patient outcomes
- Inadequate coverage of the total testing process (TTP) (Brain to brain loop)
Conclusions

- You can’t fix what you can’t measure, so quality metrics are important

- Don’t waste time measuring things you can’t or won’t fix

- Focus on the patient as well as the metric

- Don’t assume metrics will work for you
  - Follow up and intervene
  - Investigate response to interventions
  - Collect, whenever possible, “outcomes” date

- You will learn about your processes when you start measuring them
References:

• Clinical & Laboratory Standards Institute (CLSI)- GP35-A
• College of American Pathologists
• Shahram Shahangian & Susan Snyder, Am J Clin Pathol 2009; 131: 418 – 431
• Mario Plebani et al, Clin Chem Lab Med 2012
• Carlson et al, Am J Clin Pathol 2012; 138: 347 – 54
Thank You