Managing Laboratory Risk
Test Volume, Test Frequency, Test Attributes and Third Party Independent Controls
Reference materials

- ISO 14971 – 2007 Medical devices – Application of risk management to medical devices
- ISO 15189 – 2012 Medical laboratories – Requirements for quality and competence
- EP23 Laboratory Quality Control Based on Risk Management, Clinical and Laboratory Standards Institute
What is risk?

• A random event that has a negative impact
• Risk has two components
  – Probability of occurrence of harm
  – Severity of that harm
• Definitions
  – Harm – physical injury or damage
  – Hazard – source of harm
  – Severity – measure of consequences
Why do we need to be concerned?

- Serious consequences
- Can weaken the public’s confidence
- A requirement of ISO 15189
  - New approach in the US IQCP
4.12 Continual improvement

“Improvement activities shall be directed at areas of highest priority based on risk assessments.”
4.13 Control of records

“Records shall include, at least, the following:

n) risk management records”
4.15.2 Review input

“The input to management review shall include information from the results of evaluations of at least the following:

e) risk management”
4.14.6 Risk management

“The laboratory shall evaluate the impact of work processes and potential failures on examination results as they affect patient safety, and shall modify processes to reduce or eliminate the identified risks and document decisions and actions taken.”
How can the lab meet ISO 15189 requirements for risk?

- Hire a risk consultant
- Perform risk management in house
  - Application of policies and procedures to analyzing, evaluating, controlling, monitoring risk
Putting together a risk analysis team – Size and Composition

- Size
- Members
Putting together a risk analysis team – Qualities of team members

- Creative thinkers
- Confident
- Thick skinned - Competing ideas, outcomes that are not popular
- Communicators
- Pragmatic
- Curious
- Finishers
- Cynical - Always questioning, don’t accept everything at face value (Will come back to this later)
- Careful - Mistake avoidance
- Social - Team players
- Neutral – Objective, unbiased, non-threatening
- Knowledge of the device, method, technology
Risk management plan

• An organized approach to assessing and managing risk
• Establishes scope and requirements
• Assigns responsibilities
• Sets criteria for acceptability
• Establishes verification activities and feedback mechanisms
• Provides the roadmap
• Encourages objectivity
• Prevents essential elements being forgotten
Risk management process

- Risk analysis – identify hazards
- Risk estimation for each hazard
- Risk evaluation based on acceptance criteria
- Risk control
- Evaluation of residual risk
- Periodic review for effectiveness
Risk analysis

- “Voyage of reasoned thinking leading to the best possible decision at the time” – *David Vose*
- Most important element
- Informative, constructive, and non threatening
Sources of information for risk analysis

- Communication – policies, procedures, handoff
- Environmental – temperature, humidity, dust, electrical
- Knowledge – continuing education, training
- Management – commitment
- Political – outside influences
- Resources – adequate staff
- Technical – residual risk, EQA, Sigma metric
Some additional technical issues related to risk

• What’s an appropriate QC frequency?
  – When is 2 levels / day adequate?
  – Can I apply one frequency for all tests?

• Is it reasonable to reduce QC frequency on low volume tests?

• Some POCT tests say to run QC monthly, is that feasible?

• My instrument manufacturer says their QC is now 3rd party. How do I know?
Control materials

First party control materials

**Dependent control materials**

- Instrument/reagent manufacturer
- Optimized
- One analyte or multiple analytes/vial
- Same formulation as calibrators
Control materials

Second party control materials

Semi-dependent controls

- Manufactured exclusively FOR a device manufacturer
- Specific formulation/recipe
- Source
- Relationship to calibrators
Control materials

Third party control material

**Independent controls**

- Independent and without influence
- Absolutely independent of calibrator
- Can be used across multiple platforms
- Often a human based material
Risk profile characteristic: Able to effectively detect systematic error

<table>
<thead>
<tr>
<th>Type of Control</th>
<th>Ability</th>
<th>Estimated Risk Level</th>
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</thead>
<tbody>
<tr>
<td>Dependent</td>
<td>Not always</td>
<td>High</td>
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<tr>
<td>Semi-dependent</td>
<td>Not always</td>
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Sources of risk: Calibration error
Modification to reagent
Reagent lot change
Risk profile characteristic: Able to detect subtle changes in the test system

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Sources of risk:
Reagent deterioration
Deterioration of light source
Reagent stability
Risk profile characteristic: Able to signal the operator of possible effects on patient result

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Source of risk: Matrix effects
Possible responses to risk analysis findings

• Accept the risk – do nothing
• Reallocate resources
• Get more information
• Eliminate the risk entirely
• Mitigate the risk
• Have a contingency plan
• Transfer the risk
Risk estimation / evaluation

• Can take many forms
• Keep it as simple as possible
Risk control – pre-analytical (pre-examination)

- Positive patient ID
- Verification of patient instructions
- Procedures to control the sample processing once received by the lab
Risk control – analytical examination

• Frequency of QC
  – Immediacy of action
  – Medical application
• Placement of QC
• Type of QC material used
• Preventive maintenance
• Participation in EQA
• Participation in a control vendor QC program
Risk control – post-analytical (post-examination)

- Delta checks
- Algorithms that check for inconsistent results
- Retrospective review of QC data
Evaluation of residual risk

• Re-estimate risk potential after mitigation to evaluate effectiveness
• Is it acceptable?
Periodic review

• Consistent with QMS requirements
  – Effectiveness and continued relevance
Summary

• Risk analysis, assessment, management is not new to the lab
  – FORMAL risk analysis, assessment, management is new
• It does not need to be complicated
  – Keep it simple – start small
• Keep in mind the reasons for considering risk
  – Our moral obligation to the patient
  – Laboratory reputation
  – Regulatory requirement
• Keep in mind that customizing quality checks can reduce risk, sometimes substantially.