Case for Quality
Company A
Risk Management
Risk Management

Purpose and Benefits of Risk Management

• Risk Management Program
  – establishes a process to **identify** risk, **evaluate** risk, and **reduce** risk to an acceptable level

• Risk Management is performed:
  – to ensure our products and processes are **safe** and **effective**
  – throughout the **entire** product lifecycle
  – with consideration of product **use**, **design** and **manufacturing**

• Risk Management is an integral part of the Quality System:
  – Non-Conformances
  – CAPA
  – Complaints
  – MDRs
  – Recalls
USA – Food and Drug Administration (FDA):
- 21 CFR 820 Preamble
- 21 CFR 820.30(g) Design Validation:
    - “Risk” referred to in 24 separate essential requirements.

EN ISO International Standard 13485:2012 – Medical Devices - Quality Management Systems:
- Section 7.1:
  - The organization shall establish documented requirements for risk management throughout product realization. See ISO 14971 for guidance related to risk management.
- Section 7.3.2:
  - Inputs relating to product requirements shall be determined. These inputs shall include output(s) of risk management.
Risk Management Process (14971)

- Risk analysis
  - Intended use and identification of characteristics related to the safety of the medical device
  - Identification of hazards
  - Estimation of the risk(s) for each hazardous situation

- Risk evaluation

- Risk control
  - Risk control option analysis
  - Implementation of risk control measure(s)
  - Residual risk evaluation
  - Risk/benefit analysis
  - Risks arising from risk control measures
  - Completeness of risk control

- Evaluation of overall residual risk acceptability

- Risk management report

- Production and post-production information
Preliminary Hazard Analysis - Identify Hazards

Potential hazards which may occur during normal use, foreseeable misuse, installation and disposal of the product are considered taking into account the intended use

- Based on EN ISO 14971:2012, Annexes C & E

Template:

<table>
<thead>
<tr>
<th>Identification of Product Characteristics Related to Safety:</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Component</td>
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<tr>
<td>--------------------</td>
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</tbody>
</table>
## Preliminary Hazard Analysis – List of Hazards, Annex E

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Hazard</th>
<th>Hazard ID</th>
<th>Comments/Examples/Helper Text</th>
<th>Does this hazard apply to the product?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical (P)</td>
<td>Line Voltage</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>ElectroMagnetic Interference</td>
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<td></td>
<td>Laser Energy in Excess of Class I</td>
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<tr>
<td></td>
<td>Radio Frequency Radiation</td>
<td></td>
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<tr>
<td></td>
<td>Stored Electrical Energy</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>High Temperature</td>
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<tr>
<td></td>
<td>Low Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uncontrolled airborne particles</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fire</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Falling Mass</td>
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<tr>
<td></td>
<td>Suspended Mass</td>
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<td></td>
<td>Vibration</td>
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<tr>
<td></td>
<td>Stored Mechanical Energy</td>
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<tr>
<td></td>
<td>Moving Parts</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Sharp Edges</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Ultrasonic Energy</td>
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</tr>
</tbody>
</table>
Risk Analysis: Relationship between Hazard, Hazardous Situation and Harm

• Example 1
  – Hazard is electricity
  – Hazardous situation is frayed wire, short circuit
  – Harm is electric shock causing second degree burns

• Example 2
  – Hazard is cross contamination
  – Hazardous situation is reusing pipet for multiple samples
  – Harm is false result (false positive/false negative) that causes misdiagnosing patient leading to no treatment and early death
Risk Analysis

- **Risk Analysis** involves the evaluation of risk on two dimensions:
  - Severity of the harm should the harm actually occur
  - The probability of the harm occurring

- **Severity** ratings are related to harms
  - The severity of a harm cannot be affected by a risk mitigation
  - Experience provided from post-launch surveillance activities

- **Occurrence** ratings are related to the probability of a harm occurring
  - The probability of occurrence of a hazard can be affected by a risk mitigation
  - Occurrence ratings should be updated based on device field

Risk = Severity x Occurrence

Risk Assessment: Determine Risk Controls

<table>
<thead>
<tr>
<th>Risk Controls are developed in the following priority</th>
<th>Example for Sharp edge hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st  Inherently safe design and construction</td>
<td>Design out sharp edge</td>
</tr>
<tr>
<td>2nd  Protective measures</td>
<td>Provide physical shield from sharp edge</td>
</tr>
<tr>
<td>3rd  Information for safety</td>
<td>Warning label for sharp edge</td>
</tr>
</tbody>
</table>

- All possible risk controls must be employed (per EN ISO 14971:2012)
Risk Assessment: Implement and Verify Risk Controls

- Risk controls focus on:
  - Elimination of the hazard
  - Prevention or detection of the events leading to the hazardous situation

- All risk controls are themselves assessed for risk

- All risk controls have traceable evidence documented for:
  - Implementation
  - Verification of effectiveness (design V&V, process validation, engineering studies)
Residual Risk Evaluation

- The probability of occurrence of harm is **re-estimated** for each failure mode/fault after risk controls are **implemented**
  - Consider effectiveness of the implemented risk controls
  - Consider available information (design V&V studies, process validation, engineering studies)
Risk Management Report

- Upon completion of activities, a Risk Management Report (RMR) is created to show that:
  - The Risk Management Plan was appropriately implemented
  - The Overall Residual Risk is acceptable
    - The cumulative residual risk for all failure modes/faults is determined, including “Acceptable” risks
    - A Risk/Benefit Analysis is documented based on the cumulative residual risk and overall benefit of the product
    - Disclosure requirements for residual risk are defined
  - Appropriate methods are in place to obtain relevant production and post-production information
Active Risk Monitoring

- Production and post-production monitoring of risk is required for the lifetime of the product.
- A product’s Risk Management File is a living assessment of risk.
- Risks are re-assessed for product/process changes, non-conformances, CAPA, field issues.
- RMFs updated if:
  - New or unrecognized hazards or failure modes/faults/events are identified.
  - Severity or occurrence estimates have changed.