Emerging Technology in Healthcare and Conducting an ERM Risk Assessment

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Swiss Re Corporate Solutions
Learning Objectives

• Summarize benefits & liability exposure associated with 3D printing, robotics and drones in healthcare.

• Describe how to conduct a comprehensive review of risk issues with emerging technology using domains and a risk list.

• Identify the steps to conduct an ERM risk assessment.
3D Printed Medical Devices & Equipment
3D Printed Medical Devices & Equipment

- Automated method of manufacturing 3-dimensional items in which 2D layers are printed successively, one on top of the other aka “Additive Manufacturing”
- As opposed to “Subtractive Manufacturing” such as carving, sculpting, and milling
3D Printed Medical Devices & Equipment

- Medical 3D printing began in the early 2000s - custom dental implants

- **Today 3D printers** - hearing aids, contact lenses, implants, and prosthetics made to a pt’s exact body shape/contour (fraction of cost)

- MI hospital implanted a 3D printed device into a 3 mo old boy with bronchial condition and saved his life

- Man who had 75% of his skull replaced with a 3D printed implant

- **Researchers** fabricate human tissue with 3D printers and a pt’s own DNA

- Biodegradable scaffolds allow for printing an organ’s framework, inject with pt’s living cells in exact locations where they are likely to grow naturally - pt’s own cells are injected into bio printing material - lower risk of rejection

- **Future** = print a customized liver, kidney, pancreas, or heart using bio-ink - a blend of living cells that a printer will assemble into living tissue layer by layer (decrease mortality rate from chronic disease & render pt waiting lists a thing of the past)
According to Wohlers Report 2015, the 3D printing industry is expected to grow by more than 31% per year between 2014 – 2020.

Medical Applications market expected to reach $965.5 million globally in 2019 (Transparency Market Research)
3D Printed Medical Devices & Equipment
FDA Considerations

- FDA has cleared 85 applications for 3D printed devices -none for high-risk devices requiring pre-market approval

- May 2016 FDA issues “Technical Considerations for Additive Manufacturing” draft guidance for design & manufacturing, & device testing, which includes characterization, validation & verification -not intended to address 3D printed products containing biologics, cells or human tissues

- Manufacturer obligation to register with FDA
  - List their devices
  - Comply with General Controls
  - Meet Quality System requirements (including design controls and supplier controls)
  - Device testing considerations
3D Printed Medical Devices & Equipment
Changing Medicine

• Bioprinting is one of the fastest-growing areas of 3D printing (inkjet-style printers to make living tissue)

• Organovo plans to commercialize 3D-printed liver tissue. Partnership with the National Eye Institute & the National Center for Advancing Translational Sciences to print eye tissue

• Mount Sinai hospital (Toronto) developed technique for recreating replacement joints using a pt’s own tissues. 3D printer makes a bone replacement using a calcium phosphate compound - has many of same properties as human skeleton
3D Printed Medical Devices & Equipment - Prosthetics

- The “Open Hand Project” - volunteers produce 3D printed prosthetic hands. The prosthetics are free (if people can afford to pay, avg. $80 – $150)

- “Iron Man” prosthetic forearm and hand developed by “Limbitless Solutions” $300

- The group “Field Ready” 3D print umbilical cord clamps for local hospitals in Haiti, helped the earthquake victims in Nepal, and is training RedCross rescue teams to use 3D printing technology.
3D Printed Medical Devices & Equipment
Teaching and Prepping for Procedures

• **University of Kansas Hospital** – MDs study & practice on exact replicas of pts’ organs before surgery (shorter surgeries, reduced anesthesia exposure & fewer complication) – in-house 3D printer at hospital

• **Phoenix Children’s Hospital/Children’s National Medical Center in Washington, D.C./Children’s Hospital of Philadelphia** – randomized, single-blinded clinical trial to demonstrate the quantitative impact of 3D printing in healthcare - enroll 400 pts at 14 sites, split into two cohorts – **traditional surgical planning v 3D printed implants prep**
3D Printed Medical Devices & Equipment Reimbursement Considerations

• **Coverage**
  - Criteria under which a product or service will be insured for payment

• **Coding**
  - Identification system to describe product, service, procedure (HCPCS, CPT, ICD codes)

• **Payment**
  - Amount paid for a product, service, or procedure
  - Inpt. v Outpt.
3D Printed Medical Devices & Equipment Reimbursement Considerations

- FDA clearance does not guarantee Medicare COVERAGE
- Different standards
  - FDA – “Safe & Effective”
  - CMS – “Reasonable & Necessary”
- IF 3D printed implants are “safe & effective,” WILL payers determine they are “reasonable & necessary?”

- Will new 3D printed implant procedure codes & reimbursement reflect added MD prep/planning?
- Or is procedure time shorter b/c implant is custom fit & requires less surgical work?
3D Printed Medical Devices & Equipment
Reimbursement Considerations

• Will 3D printed devices be more economical w/ fewer complications, better outcomes?

• Case Example:
  - Simpler, personalized 3D treatments (custom wearable braces) for spine scoliosis may one day replace complex device implant surgery
  - Shift in treatment would result in lower payment to surgeons/physicians
  - Will there be a disincentive to offer these 3D personalized solutions to patients?
## 3D Printing ERM Risk List

<table>
<thead>
<tr>
<th>Category</th>
<th>Risk Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational</strong></td>
<td>Multi-step process; breakdowns in any step impacts whole process; calibration/maintenance</td>
</tr>
<tr>
<td><strong>Clinical /Pt Safety</strong></td>
<td>Customized product; ability to see and “practice” complex procedures; durability, sterility of devices not fully known; uniformity; infection; allergic response, EBM</td>
</tr>
<tr>
<td><strong>Strategic</strong></td>
<td>Organization can be seen as cutting edge, improved reputation</td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td>Set up costs may be high; but can deliver lower-cost products in time; med mal insurance costs</td>
</tr>
<tr>
<td><strong>Human Capital</strong></td>
<td>Increased investment in highly trained individuals; attractive environment for cutting-edge researchers; some worker exposure to particulate matter (risks not fully understood); T&amp;E</td>
</tr>
<tr>
<td><strong>Legal / Regulatory</strong></td>
<td>FDA clearance for individual devices; potential OSHA exposure from particulate matter and high-temperatures required to print devices; Who “owns” device or process?; intellectual property/patent issues; SOC issues; product liability; risk transfer between hospitals and manufacturers</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>Highly sophisticated equipment; compatibility of all components (i.e., imaging, materials and printers); Software/hardware, malware/viruses possible</td>
</tr>
<tr>
<td><strong>Hazard</strong></td>
<td>Durability of materials; do devices function as intended?; need for back-up systems in event of electrical outages, computer crash; emergency management plans</td>
</tr>
</tbody>
</table>
Resources for 3D Printing in Healthcare

Medical Articles

3D Printing In Medical Applications Market Is Expected To Reach USD 965.5 Million Globally In 2019

Regulatory Materials
U.S. Food & Drug Administration, 3D Printing of Medical Devices,
http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/3DPrintingofMedicalDevices/default.htm (accessed 2/16/17)

Robotic Devices

• **Two major categories** –
  - Direct Patient Care Robots – surgical robots, exoskeletons for walking, interactive/assistive (AI companionship)
  - Indirect Patient Care Robots – pharmacy, delivery, disinfection robots

• **Research on novel uses of robots** –
  - New uses for assisted surgery/procedures
  - Nano-bots
• **MIT (July 2016)** - developed an altered robot with AI providing scheduling recommendations to L&D nurses at Boston’s Beth Israel Deaconess Medical Center.

• Researchers trained **Nao robot** to learn about room scheduling in L&D – where nurses estimate when pts arrive in labor, length of labor, and whether C-sections or other procedures will be required.

• Nurses accepted the robot’s recommendations 90% of the time. Just to make sure the nurses weren't blindly accepting the robot's advice, the team also had the robot provide consciously bad feedback — which was also rejected at a **90% rate**.

• One nurse involved said the robot allowed "**for a more even dispersion of workload**." Another nurse thought the robot might help **"new nurses [who] may not understand the constraints and complexities of the role."**
**Robotics**

“Despite the rapid uptake of robotic-assisted surgery, the usefulness of the technology has been questioned. For many procedures, particularly those in which other minimally invasive alternatives are already available, robotic-assisted surgery has not been shown to reduce complications or improve outcomes, but it is substantially more costly than other alternatives.” Wright JD et al., “Effect of Regional Hospital competition and Hospital Financial Status on the Use of Robotic-Assisted Surgery” JAMA Surg 2016; 151(7):612-620 (citations in original)

“In general, blood loss, conversion rates, and complications were low but the operative time was longer than the open procedures, whereas the duration of hospitalization was shorter.” Papanikolaou, Surg Laparosc Endosc Percutan Tech. 2014 Dec;24(6):478-83

“has a significantly longer operation time...lower blood loss...shorter hospital stay. No statistical difference was noted based on the rate of overall postoperative complication, wound infection, bleeding, ileus and obstruction...” J Cancer Res Clin Oncol. (2016) Sep 20.

...evidence for a benefit of EBL, time to diet, similar perioperative complications and oncological outcomes, but a longer operative time in RARC. Shen and Sun BMC, Urology (2016) 16:59
Robotics

**Serious Safety Events:**
- Unintended laceration/puncture
- Bleeding/hemorrhage
- Thermal injury
- Positioning injuries
- Retained foreign bodies
- Infections—cleaning of equipment; maintaining sterile technique

**Root Causes:**
- OR staff unfamiliar with equipment & robotic protocols
- Robotics requires new patterns of communication among OR team
- Equipment malfunction, loss of power, data interruption
- Inappropriate patient & case selection
- Increased surgical time
- Surgeon’s training & experience
- Exposes hospital’s credentialing & privileging process
Robotic Dispensing System

Pharmaceutical Considerations

- Automated dispensing process
- Automated medication compounding (chemotherapy, hyperalimentation)
- Robotic delivery of prescriptions
# Robotics ERM Risk List

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>Improved efficiency, credentialing and privileging, oversight and supervision</td>
</tr>
<tr>
<td>Clinical / Patient Safety</td>
<td>Increased accuracy, lowered risk of contamination of products, anesthesia exposure increased</td>
</tr>
<tr>
<td>Strategic</td>
<td>Organization can be seen as cutting edge</td>
</tr>
<tr>
<td>Financial</td>
<td>High start up costs, but lower costs over time through improved inventory control, efficient use of resources</td>
</tr>
<tr>
<td>Human Capital</td>
<td>Decreased exposure to hazardous material, improved employee satisfaction through relieving staff of mundane tasks, training and education</td>
</tr>
<tr>
<td>Legal / Regulatory</td>
<td>Potential HIPAA exposure if systems hacked, need to assure compliance with FDA, OSHA requirements</td>
</tr>
<tr>
<td>Technology</td>
<td>Appropriate software/hardware, malware/viruses possible</td>
</tr>
<tr>
<td>Hazard</td>
<td>back-up systems in event of electrical outages, computer crash, emergency management plans</td>
</tr>
</tbody>
</table>
Resources on Robotics in Healthcare

Medical Articles


Accreditation Material

Credentialing Guidelines


Drones: Applications in Healthcare

- Federal Aviation Administration (FAA)
  - 2012 FAA Modernization & Reform Act
  - Small Unmanned Aircraft Rule (PART 107) June 21, 2016
    http://www.faa.gov/uas/media/Part_107_Summary.pdf
  - Recreational v Commercial
  - Indoor v Outdoor

SOURCE Federal Aviation Administration; American Institute of Aeronautics and Astronautics
Credit: Bart Jansen and Karl Gelles, USA TODAY
Drones: Applications in Healthcare

- (Part 107) “COMMERCIAL DRONES” effective August, 2016
- After dark flights only if drone’s anti-collision lights are visible for 3 miles
- Generally fly lower than 400 ft
- If higher than 400 ft must be within 400 ft of a structure
- Remain within sight of operator/observer in communication with operator at all times
- Operators undergo background check by TSA
- Register drone with the FAA = $5 fee
- Drone must have “aircraft markings” (an ID # that can be traced back to owner)
- Before flying, inspect drone to make sure it’s safe
- May not fly drone over people (except your own team)
- Must avoid other flying craft
- May not exceed 100 miles an hour

- **2020 estimates** - 30,000 commercial drones operating in US air space (source: GAO)
- Spending on drones **$89.5B within 10 years** (source: FAA)
- **2015-2025** commercial drones to create **100K new jobs & $82B** in economic activity (source: Basulto)
Potential utilization of drones in healthcare

- Pharmaceuticals & medical supplies – Virginia clinic
- Blood samples sent from field to lab - Johns Hopkins study 7/2015
- Stony Brook University (SUNY) & Madagascar – blood samples 7/2016
- Emergency Services (AED) – Delft University of Technology
  https://www.youtube.com/embed/y-rEl4bezWc
- India hospital testing organ deliveries
- Rapid delivery of vaccines, meds & supplies to source of outbreaks
- Indoor drones could deliver meds/supplies to the pt’s bedside
- Homecare - deliver meds/supplies to pt’s home, transport blood samples
- Falls - monitoring by drones surveying multiple rooms
- Surveillance of property & wandering/elopement management
Resources on Drones: Applications in Healthcare


Enterprise Risk Management (ERM)

ERM in healthcare promotes a comprehensive framework for making risk management decisions which maximize value protection and creation by managing risk and uncertainty and their connections to total value.

(ASHRM’s ERM Definition)
ERM

Looking into the windshield instead of the rear view mirror

Macro and Micro Risk Assessments

- Operational
- Clinical
- Financial
- Human Capital
- Strategic
- Technology
- Legal & Regulatory
- Hazard

(ASHRM's ERM work)
## ERM Domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>Description / Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational</td>
<td>inadequate/failed internal processes, people, systems that affect business operations (p/p, infrastructure)</td>
</tr>
<tr>
<td>Clinical / Pt Safety</td>
<td>delivery of care (HAC’s, Med errors, Falls)</td>
</tr>
<tr>
<td>Strategic</td>
<td>direction of organization—brand, reputation, competition, failure to adapt to changing times, health reform or customer priorities (M&amp;A, Social Media)</td>
</tr>
<tr>
<td>Financial</td>
<td>financial sustainability of organization (access to capital, external financial ratings, litigation, payer mix)</td>
</tr>
<tr>
<td>Human Capital</td>
<td>workforce (recruitment, retention, staff burnout)</td>
</tr>
<tr>
<td>Legal / Regulatory</td>
<td>ACA, fraud &amp; abuse, licensure, accreditation, product liability, management liability, CMS COPs/CFCs</td>
</tr>
<tr>
<td>Technology</td>
<td>machines, hardware, equipment, devices &amp; tools, EMR</td>
</tr>
<tr>
<td>Hazard</td>
<td>assets and their value (facility management, plant age, parking, lighting, location, security, valuables, construction/renovation, earthquakes, windstorms, tornadoes, floods, fires)</td>
</tr>
</tbody>
</table>

(ASHRM’s ERM work)
ERM Process

1. Risk Assessment (Domains) – make your risk list with your team of experts in each domain

2. Risk Ranking (Inventory) based on likelihood, impact and velocity

3. Evaluate results & risk appetite

4. Decisions – next steps

5. Refresh risk assessment periodically
ERM Risk Assessment for Drones

You are the risk officer of a health system that includes hospitals & MD practices. The CEO has asked you to analyze drones to replace the courier service currently used to transport blood samples from MD offices to the hospital’s central lab.

Considerations:

- Do we need to analyze issues in all domains in this scenario?
- How will we measure exposure and then prioritize?
- Who gets involved to do the research, plan meetings, ask the tough questions?
  - Who is the leader and reports findings?
  - Who do we report the findings to and in what format?
ERM Risk Assessment for Drones

**Operational**
- Equipment management
- Visual line of sight – operator or visual observer
- Daylight operations
- Lights at night
- Frequency of operations
- Workplace safety (flying inside/outside)
- Supply chain/vendor management (owned vs rented)
- Education (how to use the drone & anything specific that may need to be done with the vials, packing in ice, shielding from sun, handling drone, sending drone off & landing, securing drone upon landing, operator or observer person training)
- Backup plans for when drones are non-functional
- Keeping up with emerging evidence based medicine in securing samples from destruction due to environmental factors, timing, etc.

**Clinical**
- Inaccurate results & resultant treatments
- Misdiagnosis

**Financial**
- Access to capital
- Return on investment – future use
ERM Risk Assessment for Drones

**Human Capital**
- Shifting couriers to other assignments or eliminating need and adding operator and observer

**Strategic**
- Competition – speedier results and treatment decisions with greater provider/pt satisfaction

**Technology**
- Performing as expected
- Malfunctions
- Unprotected radio frequency with vulnerability to intentional/unintentional interference
- GPS jamming and spoofing
- Velocity of change with industry science
ERM Risk Assessment for Drones

**Legal & Regulatory**
- FAA compliance
- State and local regulations
- Insurance – product liability, GL, privacy, cyber, workers’ comp, property – crash and damage to others, owned/non-owned property, the drone itself
- Privacy issues if drones have cameras

**Hazard**
- Biological issues if blood spills from accident, etc.
- Weather related issues (rain, snow, hail, wind) interruption to flight
- Interference by animals, foul play, etc.
# Sample Risk Assessment Scales: Likelihood

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Almost Certain/Already Occurring</td>
<td>• In System/Process: Knowledge-based decisions by trained person</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Controls: Not working/may not exist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expected to Occur: Daily/weekly</td>
</tr>
<tr>
<td>4</td>
<td>Likely</td>
<td>• In System/Process: Rule-based decisions by trained person</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expected to Occur: Annually</td>
</tr>
<tr>
<td>3</td>
<td>Potential</td>
<td>• In System/Process: Automated or controlled by trained person</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Controls: Preventative, not detective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expected to Occur: Every 2 – 5 years</td>
</tr>
<tr>
<td>2</td>
<td>Unlikely</td>
<td>• In System/Process: Highly automated with validation and monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expected to Occur: Every 5 – 20 years</td>
</tr>
<tr>
<td>1</td>
<td>Rare</td>
<td>• Controls: Preventative and detective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Not expected to occur</td>
</tr>
</tbody>
</table>

(ASHRM’s ERM work)
<table>
<thead>
<tr>
<th>Rating</th>
<th>Financial</th>
<th>Patient Safety</th>
<th>Operations/Process</th>
<th>Reputational</th>
<th>Legal/Regulatory</th>
</tr>
</thead>
</table>
| 5      | Cash: Results in <20 days cash on hand  
        Property damage: >$250,000  
        Key contract loss  
        Loss of business | Death/permanent disability  
        Event: Suicide/rape/ child abduction | Significant labor relations event  
        Workplace safety: multiple lost time injuries/recordable incidents  
        PHI/PI Breach: >100 | Significant brand impairment; loss of significant market share  
        Sustained, negative media coverage  
        Customer satisfaction: <85% | Loss of license  
        State/Federal investigation |
| 4      | Cash/expense: $150,000  
        Property damage: $100,000 - 250,000  
        Additional unexpected capital required | Substantiated boundary or code of conduct incident  
        Major or critical health incident  
        Non-compliance with Standard of Care | Loss/significant turnover of key personnel  
        IT systems disruption  
        Workplace safety: Lost time and recordable incidents  
        PHI/PI Breach: <100 | Temporary but significant negative media coverage  
        Customer satisfaction: 85-88% | State/Federal inquiry (not investigation) |
| 3      | Cash/expense: $50,000  
        Property damage: $10,000–100,000 | Upward trend in minor health incidents  
        No clinical continuity | Loss of or increased turnover in key positions  
        Operational disruption or increased costs due to regulatory change | Negative media mention (state)  
        Customer satisfaction: 88-90% | Corporate non-compliance with financial impact  
        Insurance access implications |
| 2      | Cash/expense: $10,000  
        Property damage: <$10,000 | Minor health incidents; patient not knowledgeable of failure | Distraction in employee base | Customer satisfaction: 90–94% | Minor violations (e.g., auto) |
| 1      | Insignificant property damage or impact to cash | No impact on the delivery of care | | Customer satisfaction: >95% | |

*(ASHRM’s ERM work)*
# Sample Risk Assessment Scales: Velocity

<table>
<thead>
<tr>
<th>RATING</th>
<th>VELOCITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Immediate</td>
</tr>
<tr>
<td>4</td>
<td>1-2 years</td>
</tr>
<tr>
<td>3</td>
<td>2-5 years</td>
</tr>
<tr>
<td>2</td>
<td>5-10 years</td>
</tr>
<tr>
<td>1</td>
<td>&gt; 10 years</td>
</tr>
</tbody>
</table>

The rating number matches with the timeframe that most appropriately represents the time it would take the risk event to reach the defined impact level.
## Risk Ranking Formula

\[
\text{Risk Score} = (\text{Likelihood} + \text{Velocity}) \times \text{Impact}
\]

- **Likelihood** and **Velocity** are on a scale of 1 to 5.
- **Impact** is also on a scale of 1 to 5.

<table>
<thead>
<tr>
<th>(Likelihood)</th>
<th>+</th>
<th>Velocity</th>
<th>\times</th>
<th>Impact</th>
<th>=</th>
<th>Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a value 1 to 5)</td>
<td></td>
<td>(a value 1 to 5)</td>
<td></td>
<td>(a value 1 to 5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1 + 1) = 2</td>
<td>\times</td>
<td>1</td>
<td></td>
<td></td>
<td>=</td>
<td>2 (lowest possible score)</td>
</tr>
<tr>
<td>(5 + 5) = 10</td>
<td>\times</td>
<td>5</td>
<td></td>
<td></td>
<td>=</td>
<td>50 (highest possible score)</td>
</tr>
</tbody>
</table>
# Risk Inventory

## Risk Inventory (DRONES)

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Domain</th>
<th>Likelihood (1-5)</th>
<th>Velocity (1-5)</th>
<th>Impact (1-5)</th>
<th>Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drones must be used within <strong>visual line of sight</strong> based on regs (need an operator or visual observer)</td>
<td>Reg/Tech</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>Biohazard from blood spill</td>
<td>Hazard</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Weather related issues (<strong>rain, snow, hail, wind</strong>) that interrupt drone flights</td>
<td>Hazard</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>Inaccurate test results &amp; subsequent treatment</td>
<td>Clinical</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>Keeping up w/ <strong>emerging evidence based medicine</strong> for blood samples &amp; potential for compromise due to env't factors, timing, etc.</td>
<td>Operational</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Backup plans for <strong>downtime</strong> when drones are non-functional</td>
<td>Operational</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td><strong>Access to capital</strong> for drone technology (UAVs, control station, data links, telemetry, communications &amp; navigation equipment)</td>
<td>Financial</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td><strong>Training</strong> (using the drone and anything special that may need to be done with the labs, packing in ice, shielding from sun, security of drone, handling drone, sending drone off and landing, securing drone upon landing, the operator or observer roles)</td>
<td>Operational</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Shifting couriers to other assignments or <strong>eliminating jobs</strong> (adding operator and observer)</td>
<td>Human Capital</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td><strong>Return on Investment</strong> (future use for other tasks)</td>
<td>Financial</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>
Risk Appetite

**QUESTIONS:** Risk Appetite & Decisions

- Is there more value than risk?
- Is there more value creation than protection potential?
- Can risks identified be mitigated easily?
ERM Resources


- ERM: From Incentives to Controls  – James Lam

- Harvard Business Review

- Association of Healthcare Internal Auditors (AHIA) [http://www.ahia.org](http://www.ahia.org)

- Healthcare Financial Management Association (HFMA) [http://www.hfma.org](http://www.hfma.org)
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