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Ranked Best.
10 Years and Counting.

BEST HOSPITALS
US News
NATIONAL RANKED HOSPITALS
2016-17
A Strange Thing Happened on the Way Back from Last Year’s OAS Meeting…

Y-90 Therasphere Incident
Aug 24, 2017
Disclaimers

- Reference to equipment, products or services in this presentation does not constitute an endorsement by The University of Kansas Hospital

- The presenter is an employee of The University of Kansas Hospital
Objectives

Å Describe the Incident
  ï The place
  ï The players
  ï Chain of events

Å Lessons Learned
  ï Root Cause and Corrective Action
    Å Training
    Å Procedures
THE PLACE and PROCESS

- University of Kansas Hospital

- Interventional Radiology (IR)

- 2nd Floor of Main Hospital

- 6 IR suites affected

- 3 IR suites primary Y-90 therapy
THE PLACE and PROCESS

THE UNIVERSITY OF KANSAS HOSPITAL
ADVANCING THE POWER OF MEDICINE
THE PLACE and PROCESS

- **Y-90 Therasphere Therapy**
  - Treatment of liver cancer (HCC)
  - Delivered by catheter through the hepatic artery
    - High energy beta-emitter with 64 hour T1/2
    - Neutron activated from Y-89
    - Glass microspheres 20 – 30 microns
    - THERA – High Specific Activity vs SIRSPHERE
      - 2500 Bq per sphere vs 50
  - Approximately 7 procedures a week
THE PEOPLE

- Interventional Radiology
  - Two MDs (with fellows)
  - Nurses, techs, anesthesiologists

- Radiation Safety
  - Radiation Safety Officer (RSO)
  - Health Physicist (HP)
  - Two Rad Safety Program Coordinators (RSPC)

- Radiology Staff
  - Director
  - Assistant Director
  - Managers
THE PEOPLE
THE INCIDENT
Aug 24, 2017
Approximately 4:00 PM

Boarding the plane when suddenly the phone rings...
TIMELINE

Å Layover Dallas Ft. Worth

- Hospital Incident Command activated
- RSO (Tom Conley) receives call from VP
  - Considered bringing in a Hazmat team
  - RSO advised against until an assessment could be done
- HP reestablishes contact with RSPC
- Received conflicting information on status and scale
  - The RUMOR MILL was in full swing
  - Through RSPCs, able to determine actual extent and assess situation
  - Gave direction to begin clean up
TIMELINE - Thursday

- Approximately 3:15 PM August 24, 2017
- Therasphere setup in IR procedure room 2
- *Vial pierced prior to priming the system*
  - Technologist attempted to prime the system
- Release of ~ 40 mCi of Y-90 microspheres in liquid
- Tech left the room to consult with physician AU
- Contamination into the central core hallway
- Staff spread contamination to other areas within IR.
TIMELINE - Thursday
TIMELINE - Thursday

Â Tech was surveyed and found to be contaminated
   ï Placed into a bunny suit and booties
   ï Escorted to ED decon shower

Â Perimeter established through physical controls and onsite security.
   ï Surveys continued to further establish non-contamination zones
TIMELINE - Thursday

BACK ON THE PLANE!!!
TIMELINE  •  Thursday 10:30 PM

• RSO and HP onsite
• Confirmation from RSPCs that no contamination outside of IR.
  Â Extensive surveys of hallway, stairwells, walls, floors, personnel.
• No other personnel contaminated
  Â All personnel leaving IR surveyed
  Â About 4 pair of shoes confiscated
• Determination made by RSO and administrative staff to shut down IR until department could be adequately assessed and cleared of contamination.
TIMELINE - Friday
THE ASSESSMENT AND CLEANUP

Â Friday ï Aug 25
Â State agency (KDHE) notified
Â SURVEYS! MORE SURVEYS!
   ï All Rooms and areas within IR cleared by survey and wipe test.
      Â EXCEPTION - IR suite #2 (location of spill)
   ï Several contamination areas found outside of IR 2
      Â In front of sink
      Â Carpet in reading room
      Â Hallway in main corridor (multiple)
      Â IR suite 3
TIMELINE - Monday
State Regulatory Agency

Å KDHE reactionary inspection
  ï Through interviews the team confirmed the timeline
  ï Confirmed assessment of contamination
  ï Determined root cause to be inadequate training

Å State cognizant of allowing us to adequately assess and begin cleanup with a focus on patient care

  ï Discussed definition of abnormal occurrence and medical event.
  ï Determined the incident did not meet either criteria
TIMELINE Ḷ Monday/Tuesday
IR Suite 2 DECON

Å IR Suite 2 - Extensive Contamination
TIMELINE ï  Monday/Tuesday
IR Suite 2 DECON

Å IR Suite 2 - Extensive Contamination

Å Masslin wipes

Å Dawn dish soap

Å Scrape and survey
This is my Ludlum Model 26-1!
There are many like it but this one is mine!
**DOSE TO TECHNOLOGIST**

**Skin Dose equation**

\[ H_{T(skin)} = \frac{C_{\text{skin}} \times CF_{\text{beta-skin}} \times t}{SF_{\text{beta}}} \]

Where

- \( H_{T(skin)} \) = Equivalent dose to the skin [\( \mu \text{Gy} \)].
- \( C_{\text{skin}} \) = Average surface concentration of radionuclide on skin or clothing [Bq/cm\(^2\)].
- \( CF_{\text{beta-skin}} \) = Conversion factor: skin beta dose rate \([\mu \text{Gy/h}] / \text{Bq/cm}^2\)\].
- \( SF_{\text{beta}} \) = Shielding factor for beta radiation due to clothing; representative values of shielding factors are approximately 3 - 5 for light clothing and 1000 for heavy clothing.
- \( t \) = Time of exposure [h]

<table>
<thead>
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<th>ncpm</th>
<th>Probe area cm(^2)</th>
<th>Probe eff.</th>
<th>Cskin (Bq/cm(^2))</th>
<th>Cbeta-skin ([\mu \text{Gy/h}] / \text{Bq/cm}^2)</th>
<th>SFbeta</th>
<th>t (h)</th>
<th>Skin Dose (( \mu \text{Gy} ))</th>
<th>Skin Dose (rad)</th>
<th>Assumptions</th>
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<td>90000</td>
<td>12.25</td>
<td>0.22</td>
<td>557</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>445</td>
<td>0.045</td>
<td>All contamination was on clothing</td>
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<tr>
<td>660</td>
<td>12.25</td>
<td>0.22</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>0.000</td>
<td>Skin contamination found after initial decon</td>
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</table>
ROOT CAUSE ANALYSIS

 Entire process reviewed including written procedures and policies.

 Determination of lack of adequate training on specifics of process during set up.

 Determination that Y-90 procedures were inadequate in certain areas (box set-up in particular)
LESSONS LEARNED and CHANGES IMPLEMENTED

- Hands-on Vendor training on box prep and setup for both types of Y-90 microspheres

- Developed extensive and specific training for Y-90 techs, nurses, and physicians on Y-90 and radiation contamination control fundamentals.
LESSONS LEARNED and CHANGES IMPLEMENTED

Procedural changes ï
- Hand and foot monitor after vial pierce
- Only MD pierce the vial
- Spill kits specific to RAD developed (small/large)
- Use of updated checklist TIMEOUT sheet to be read/reviewed prior to each proc
- Flow and accuracy of information
NOT DONE YETé

Å DECON SHOWER WASTE WATER
- Sampled and released

Å THERASPHHERE WASTE
- Due to manufacturing process
- Long lived impurities
- Disposed about 2 cubic yards through waste broker
Would you have done differently:

Survey and decon the tech in the IR locker room:
- Reduce further risk of contamination increase by keeping tech within IR
- Only send to ER decon shower if unable to decon

Instrumentation:
- MCA (waste constituent analysis)
- Gas flow proportional counter
- Floor surveys
QUESTIONS?