**Problem**

**What**

Problem(s): Patient overexposed to radiation

**When**

Date: September 14-18, 2015

Different, unusual, unique: Use of two beams to deliver treatment (1 used more commonly)

**Where**

Facility, site: Edinburgh, Scotland

Unit, area, equipment: Cancer Center

Task being performed: Palliative radiotherapy

**Impact to the Goals**

<table>
<thead>
<tr>
<th>Patient Safety</th>
<th>Significant possibility of serious harm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compliance</td>
<td>Report to, investigation by Scottish Ministers</td>
</tr>
<tr>
<td>Patient Services</td>
<td>Patient received double dose of radiotherapy</td>
</tr>
<tr>
<td>Property/ Equipment</td>
<td>Ongoing support, monitoring</td>
</tr>
</tbody>
</table>

**Frequency**

10 years since last “serious overexposure” for a patient undergoing radiotherapy in Scotland

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**Analysis**

**Detailed Cause Map - Add detail as information becomes available.**

"The particular circumstances of this Edinburgh incident were that the treatment was properly prescribed in accordance with the applicable ECC treatment protocol, but errors were made in the subsequent process of planning how the prescribed treatment was to be delivered. These errors remained undetected, such that the treatment planners sent the wrong information to the radiographers who delivered the treatment. The setting used on the treatment machine was therefore what it should have been, and remained so for all five ‘fractions’ of the treatment process."

- Dr Arthur M Johnston, Warranted Inspector appointed by the Scottish Ministers

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**Solutions**

As a result of this incident, the inquiry into the error made several recommendations for the treatment plan process to avoid this type of error from recurring. Specifically, the inquiry recommended that the procedure and training for manual calculation be improved, independent verification be performed using a different method, procedures for use of the computer be improved (including required training on its use), and requiring manual calculations to be redone when not in agreement with the computer. All of these solutions reduce the risk of the error occurring.

There is also a related solution that does not reduce the risk of having an error, but increases the probability of it being caught quickly. This is to outfit patients receiving radiotherapy with a dosimeter so their received dose can be compared with the ordered dose. (In this case, the patient received 5 treatments; had a dosimeter been used and checked the error would likely have been noticed after only one.)

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**Why?**

**Effect**

Possible Solution: Require training for use of computer

Possible Solution: Procedure not recommended by software manufacturer

Possible Solution: No requirement to train on its use

Possible Solution: Procedure updated in February 2015

Possible Solution: Radiographers not retrained on new procedure

Possible Solution: Use of computer

Possible Solution: Require manual calculation of dose

Possible Solution: Ineffective manual calculations

Possible Solution: Computer error ‘overridden’

Possible Solution: Radiographers believed manual calculation correct

Possible Solution: Computer alerts ignored

Possible Solution: Treatment planner initially calculated dose

Possible Solution: Incorrect dose calculated by radiographer

Possible Solution: Error in manual calculations

Possible Solution: Verification calculation incorrect

Possible Solution: Incorrect dose value entered in treatment plan

Possible Solution: Prescribed for treatment of vertebral pain

Possible Solution: Incorrect dose calculated by radiographer

Possible Solution: Use of dosimetry to compare actual radiation to order

Possible Solution: Use of different method of calculating

Possible Solution: Different, unusual, unique

Possible Solution: Patient received double dose of radiotherapy

Possible Solution: Patient overexposed to radiation

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**Cause Mapping**

Problem Solving • Incident Investigation • Root Cause Analysis

Step 1: Problem

What's the Problem?

Step 2: Analysis

Why did it happen?

Step 3: Solutions

What will be done?

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**Cause Map**

- **RADIO THERAPY OVERDOSE**

**Two employees make same mistake in calculations; override computer warning**

- Manual calculation for 2 beams

- Error in manual calculations

- Error in manual calculations

- Complex calculation performed manually

- Computer error ‘overridden’

- Computer alerts ignored

- Lack of confidence in computer calculations

- Alerts come up frequently

- Evidence: Investigation found that moving to another screen causes alert to disappear

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For a free copy of our Root Cause Analysis Template in Microsoft Excel, visit our web site. For a free copy of our Root Cause Analysis Template in Microsoft Excel, visit our web site.