What Can Go Wrong in Radiation Treatment?

Part 1: Overview

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AAPM/ASTRO Safety in Radiation Therapy

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What Can Go Wrong in Radiation Treatment?

Outline

1. What does going wrong mean?
2. Where do we find out what can go wrong?
3. What causes things to go wrong?
4. What can we do to make radiation treatment safer?
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Outline

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What does going wrong mean?

We frequently associate things going wrong with “error”

An Error is a failure to complete a planned action as it was intended or a situation in which incorrect methods and/or data are used in an attempt to achieve a given aim.
What does going wrong mean?

A broader term might be more useful

An incident is an unwanted or unexpected change from a normal system behavior, which causes, or has a potential to cause, an adverse effect to persons or equipment.
What does going wrong mean?

Consequences of an Incident/Error

- No effect on the safety or quality of treatment
- Erosion of quality
- A clinically significant adverse event

Deviation from optimum dose
What does going wrong mean?

Distribution of incident severity

- Critical
- Major
- Serious
- Minor

Centre A
Centre B
What does going wrong mean?

Any deviation from the intended pathway.

A deviation may or not impact a patient.

We can learn from those events that have no clinical impact (minor and potential incidents).
What does going wrong mean?

• **Unsafe** = extreme compromise of quality.
• Let’s not forget the patients caught in the “quality trap”.

![Graph showing distribution with labeled points](image)
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Where do we find out what can go wrong?

Sources of Information

In the last two years there have been three major reports of accidents in radiation therapy

• The World Health Organization published its “Radiotherapy Risk Profile”¹

• A consortium of UK professional bodies published “Towards Safer Radiotherapy”²

• The International Commission on Radiological Protection is publishing “Preventing Accidental Exposures from New External Beam Radiation Therapy Technologies”³

¹ www.who.int/patientsafety/activities/technical/radiotherapy_risk_profile.pdf
² www.ipem.ac.uk/docimages/2329.pdf
³ www.icrp.org
Where do we find out what can go wrong?

Sources of Information

- The WHO study describes 21 actual and 28 potential incidents for which some level of documentation is available.
- The UK study described 5 incidents in some detail although 181 had been reported over a six year period.
- The ICRP report details 11 incidents.
Where do we find out what can go wrong?

**Sources of Information: ROSIS**

- Radiation Oncology Safety Information System
- [http://www.rosis.info/](http://www.rosis.info/)
- ROSIS began in 2001, funded by ESTRO – European Society for Therapeutic Radiology and Oncology
- Voluntary, anonymous, web-based reporting system
Where do we find out what can go wrong?

**Sources of Information:**

**New York State**

- Adverse event reporting has been required by the Department of Health, New York State since 1985. (paper reports initially)
- Event database established in 2001
- 230 events from (an estimated) 373,000 patients reported from 2001 to 2009.
- Most were caught early and did not result in patient harm.
- 46 needed follow up care.
Where do we find out what can go wrong?

• There are lots of sources.

• Most of us don’t have the time to study all these on-line and printed sources.

• A continuously updated distillation of relevant information would be a service to the community

• Could a well constructed and resourced central database facilitate learning from the experience of our colleagues?
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What causes things to go wrong?

New York State

Selected Causes/Contributing factors

- Therapist error: 84%
- Failure to follow policies/procedures: 63%
- Incorrect body part: 46%
- Physics/Dosimetry: 27%
- Wrong patient: 19%
- Inadequate policies/procedures: 16%
- RO error: 12%
What causes things to go wrong?

Calgary/Ottawa

Basic Cause Distribution

1 Standards/Procedures Practices
2 Materials/Tools/Equipment
3 Design
4 Planning
5 Communication
6 Knowledge/Skill
7 Capabilities
8 Judgment
9 Natural Factors
What causes things to go wrong?

### Calgary/ROSIS

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<th>ROSIS</th>
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<td>Standards/Procedures/ Practices</td>
<td>Standards/Procedures/ Practices (≈54%)</td>
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<td>Communication (≈17%)</td>
<td>Planning (≈16%)</td>
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<td>Judgment (≈11%)</td>
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<td>Materials/Tools/ Equipment (≈9%)</td>
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<td>Planning (≈4%)</td>
<td>Judgment (≈6%)</td>
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<td>Design (≈3%)</td>
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<tr>
<td>Capabilities (≈2%)</td>
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What causes things to go wrong?

- Human factors, 60 – 80% of incidents.
- Something to do with policies/procedures is dominant.
- We don’t know the relationship between the severity of the outcome and the causes/contributing factors.
- Could a well constructed and resourced central database help us to understand causal factors?
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What can we do to make radiation treatment safer?

**Equipment design:**
- Today at 9.30,
- Tomorrow at 9.00

**Regulations:**
- Today at 10.45

**Process flow:**
- Today at 11.30

**Certification of individuals:**
- Today at 3pm

**Accreditation of institutions:**
- Tomorrow at 10.30
What can we do to make radiation treatment safer?

60-80% of incidents seem to be associated with human factors.

Can we do something to directly address human factors issues?
What can we do to make radiation treatment safer?

Can we do something to directly address human factors issues?

• Minimize human interaction.
• Improve human performance, behaviour, attitude.
What can we do to make radiation treatment safer?

The human factors issue

**PREMISE:**

Education + Information

» Improved Performance
What can we do to make radiation treatment safer?

The human factors issue

**PREMISE:**

*Education + Information*

» Improved Performance
What can we do to make radiation treatment safer?

**Education: Workshops**

**WORKING TOWARDS SAFER HEALTHCARE DELIVERY**

*Minimising the impact of incidents in radiotherapy*

A four day theoretical and practical course facilitating participants to identify factors involved in incident occurrence and analysis and preventative processes that can be implemented.
What can we do to make radiation treatment safer?

Education: Workshops

2010 COMP Winter School
Quality & Safety in Radiation Oncology
Banff, Alberta, Canada
January 24 - 28, 2010
What can we do to make radiation treatment safer?

Education: Symposia

AAPM Annual Meeting

Continuing Education Track

Error Management and Patient Safety in Radiation Therapy

10am – 12pm: Wednesday 21st July 2010
What can we do to make radiation treatment safer?

**Education: A Course for Radiation Medicine Professionals**

**Ethics and Errors**

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What can we do to make radiation treatment safer?

The human factors issue

PREMISE:

Education + Information

» Improved Performance
What can we do to make radiation treatment safer?

Information: Local database

Washington University Database

What can we do to make radiation treatment safer?

Information: National/supranational database

IAEA’s SAFRON

IAEA Consultants Report
What can we do to make radiation treatment safer?

Challenges in sharing information: Communication

We use words like error, mistake, incident, misadministration.

Do they mean the same thing or are they all different?

Besides the words we need to agree on:

- Process maps
- Severity metrics
- Basic causes
What can we do to make radiation treatment safer?

Challenges in sharing information: Environment

• In many jurisdictions there are legal impediments to full disclosure of the details of incidents.

• Even if there were no legal impediments, are we sufficiently committed to a safety culture to take the time to report and analyze incidents and to learn from the reported experience of others?
What can we do to make radiation treatment safer?

The human factors issue

A quote from 2003¹:

“Errors often follow violations in protocols, particularly failures to perform verification procedures, and indicators that things are not correct are often present yet ignored during events.”

A Catastrophic Incident from 2005²:

1. Thomadsen et al. IJROBP 2003 (57) 1498