Case study: Implementing a Radiation Incident Coding System

Background:

UK legislation [1] requires the employer to establish a system for recording analyses of events involving or potentially involving accidental or unintended exposures. In June 2019 a joint working party (IPEM, RCR and SCoR) report to the Clinical Imaging Board (CIB) made several recommendations including the need for a '*standard categorisation system* of incidents' [2] involving exposure to ionising radiation. The following short case study details an attempt to implement this standard categorisation of radiation incidents, with benefits identified.

Method:

Unable to embed the framework into the resident incident reporting system, a columnar coding framework based on the 2019 report was added to the Hospital's Diagnostic Imaging radiation incident spreadsheet (fig.1). For consistency and error reduction, data entry was limited to a pre-defined list of options and coding of incidents was performed by trained incident investigators and validated in regular radiation incident review meetings. Pivot table analysis was used for statistical evaluation and trend identification in producing annual radiation incident reports, and the final incident code was automated using the CONCATENATE Excel function.

Fig 1. Coding framework columns, (number of columns reduced for graphical demonstration)

Severity Level (1 - 3)	Exposure type (1 - 4)	Performed Modality (1 - 7)	Intended Modality (A - I)	Duty holder (DH) (1-5)	Referral type or role involved (from grey boxes)	Primary classification (Tier 1)	Secondary classification (Tier 2)	Contributory Factor (CF) (1 - 7)	Sub-Category	Final Code
2 – Error - non-reportable (statutorily)	2. Non medical imaging using medical	1 - General radio	A - General radiology	5 - None	5f- None	1 NO None	a1NO) Equipment related	CF3 Technical	CF3a) Equipment or IT network failure (including	2/2/1/DH5f/T11 /T2a/CF3a
2 – Error - non-reportable (statutorily)	1. Medical Exposure	1 - General radio	A - General radic B - Computed To C - Nuclear Medi D - Fluroscopy E - Mammograph F - DXA G - Interventiona H - MRI	Operator	4c) Radiographer	4 O Pre-exposure safety checks	e4O) Wrong anatomy / anatomy missed	CF1 Individual	CF1c) Slips and lapses (skill-based, involuntary automaticity	2/1/1/DH4c/T14 /T2e/CF1c

Results and Discussion:

Pivot table analysis of data gave a greater depth of detail than previous assessments, where incidents by IR(ME)R referrer was simply given by numerical count only. Fig 2 shows a breakdown of IR(ME)R referrer incidents from the 2019/2020 annual report, which demonstrates how the coding index enabled further clarification of incidents by incident type and location of referrers, enabling focussed feedback and learning from incidents. The results from Fig 2 led to a presentation at the Hospital's outpatient forum on 'Quality in = Quality out for imaging referrals'. Fig 3 shows the same results from the 2020/2021 annual report, demonstrating a 50% reduction in referrer-related incidents. However, the CQC IR(ME)R annual report [3], has highlighted a correlation between activity and incidents and therefore this result must be viewed in context against a background of a 12% reduction in activity in the same time frame.

Conclusion:

Coding of radiation incidents using the CIB framework has enhanced the focus and quality of feedback from radiation incidents. Using pivot data analysis to draw attention to useful information, has improved the quality and the efficiency in producing annual incident reports and ultimately compliance with UK legislation [1]. Collaborative working between incident investigators and the Medical Physics team has improved shared learning and understanding of the chief causes of radiation incidents in an NHS teaching hospital. The benefits of utilising the coding index has been recognised locally, and work is underway to embed the CIB framework into the resident incident reporting system to further improve efficiency.

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References:

[1] The Ionising Radiation (Medical Exposure) Regulations 2017. Regulation 8(3)

[2] Royal College of Radiologists (RCR). Learning from ionising radiation dose errors and near misses in UK clinical imaging departments. June 2019

[3] Care Quality Commission (CQC). IR(ME)R annual report 2020/2021.

Fig.2 IR(ME)R referrer incidents type and location. (2019 /2020)

Row Labels	Count of Secondary classification (Tier 2)
2 - Referrer	**32**
1 R Wrong patient	**6**
a5R) Insufficient/inaccurate demographic information	5
RIa) Insufficient/inaccurate demographic information	1
2 R Wrong requested modality	**1**
RAb) Region	1
3 R Wrong anatomy	**3**
a3R) Laterality / Side	1
b3R) Region	2
5 R Referral information	**21**
b3R) Region	1
b5R) Insufficient/inaccurate clinical information	17
e5R) Pregnancy status not checked	1
g5R) Duplicate; no check of previous imaging	2
6 R Patient preparation	**1**
a6R) Psychological preparation (including consent)	1
7 R Working outside of Scope of Practice	
(blank)	
Grand Total	**33**

Referrer Incident by location

Row Labels	Count of Referral type or role involved (from grey boxes)
2 - Referrer	**33**
2a) In-patient referral	8
2b) Out-patient / Clinic referral	19
2c) A&E patient referral	5
2h) Other: Free text	1
Grand Total	**33**

Fig 3.IR(ME)R referrer incidents location (2020/2021)

Row Labels	Count of Referral type or role involved (from grey boxes)
2a) In-patient referral	5
2b) Out-patient / Clinic referral	8
2c) A&E patient referral	3
Grand Total	**16**

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