Safer Radiotherapy
The radiotherapy newsletter of Public Health England

Supplementary Data Analysis
Issue 15 – Full quarterly radiotherapy error data analysis
September 2014 to November 2014
About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. It does this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. PHE is an operationally autonomous executive agency of the Department of Health.
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Full quarterly radiotherapy error data analysis
September 2014 to November 2014

This analysis has been undertaken by Public Health England (PHE) on radiotherapy errors and near misses (RTEs) reported voluntarily by NHS radiotherapy (RT) departments. Reports are submitted from England and Wales to the National Reporting and Learning System (NRLS) using the TSRT9 trigger code\(^1\), and directly to PHE from Northern Ireland and Scotland.

The classification and coding from *Towards Safer Radiotherapy*\(^2\) (TSRT) was employed for the analysis. Where appropriate, comparisons have been drawn with previous issues of *Safer Radiotherapy*\(^3\) and the PHE supplementary data analyses\(^4\).

The analysis has been reviewed by the Patient Safety in Radiotherapy Steering Group whose comments have been incorporated into this document.

Between September and November 2014, 52 NHS RT departments submitted RTE reports using the TSRT9 trigger code, representing a majority of departments from across the UK. The percentage of participating departments has increased from 86.4\%(n = 51) at the last analysis (June to August 2014) to 88.1\%(n = 52) within this reporting period. This continued increase of departments reporting reflects the commitment of the community to improving patient safety in radiotherapy. However, it is clear that there is some disparity in the regularity of reporting, with wide variance shown when comparing the incident date with the date reported to the national voluntary reporting scheme. This time lag ranges from a minimum of 1 day to a maximum of 280 days, with a mean of 51 days. Issue 13\(^3\) of *Safer Radiotherapy* provides further information on the frequency of reporting.

The number of departments contributing to each issue of *Safer Radiotherapy* and the supplementary data analysis series is illustrated in Figure 1. This will help local departments to compare identified trends against the national picture.

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**NB.** Departments contributing to the national analysis are allocated a unique identifier in order to anonymise the data shared with PHE.

*If individual departments can offer further advice in preventing any RTEs please email the RT team at radiotherapy@phe.gov.uk.*
Figure 1. Number of radiotherapy departments contributing to each issue of *Safer Radiotherapy* and the supplementary data analysis

The number of departments submitting RTE reports has increased significantly since 2010, with all NHS departments across the UK having now participated in this initiative (Figure 1).

Figure 2. Monthly average number of incident reports contributing to each issue of *Safer Radiotherapy* and the supplementary data analysis
A mature reporting culture is reflected by an increase in the average number of reports submitted each month (Figure 2). This has grown over the past 12 months from an average of 416 reports per month to 564 in this reporting period. It should be noted that the vast majority of these reports are lower level incidents having no significant effect on the planning or delivery of individual patient treatments. It is expected that the number of departments submitting to this analysis on a regular basis will increase, leading to an increase in the number of reports.

**Monitoring of TSRT classification and coding by RT departments**

The TSRT classification and coding had been applied by local RT departments to 1481 of the 1707 RTEs received between September and November 2014. This demonstrates a continuation of the high adoption rate in the application of the TSRT classification. All departments are asked to apply classification and coding to their RTE reports to facilitate both local and national analysis.

Consistency checking was undertaken by PHE staff on the application of the TSRT classification and coding system by RT departments. From the 1481 RTE reports classified and coded, a 77.1% level of consistency was achieved (Figure 3). This demonstrates a slight decrease from the last analysis (87.3%). The *Good Practice in Radiotherapy Error Reporting – Supplementary Guidance Series* gives examples of the application of the classification and process coding. In addition, 211 RTEs were classified and coded by PHE staff using the supporting text supplied by the local departments. Issue 8 of *Safer Radiotherapy* provides top tips for the application of coding and classification. PHE is working with departments from Scotland and Northern Ireland to support the application of coding. Future consistency checking of submitted reports will continue to maintain the high quality of data contributing to the national analysis and learning from RTEs.

Non-RTE reports submitted with the TSRT9 trigger code formed 0.9% (n = 15) of the total number of reports for this reporting period. Data and accompanying text indicate that these were patient safety incidents (PSI). This is consistent with previous analyses. Further information on PSI can be found in issue 5 of *Safer Radiotherapy*. The non-RTE reports were excluded from the detailed analysis.

In total, 1692 RTEs for the reporting period from September to November 2014 were included for analysis. The analysis is presented here.
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Figure 3. Breakdown of reports, September to November 2014 (n = 1707)

Classification of radiotherapy errors

Each of the 1692 reports was classified as ‘other non-conformance’, ‘near miss’, ‘minor radiation incident’, ‘non-reportable radiation incident’ or ‘reportable radiation incident’ (Figure 4). Of the RTE reports, 97.4% (n = 1649) were minor radiation, near miss or other non-conformities with little or no impact on patient outcome. Of the remaining 2.6% (n = 43) of RTE reports, only 1.6% (n = 27) were reportable under IR(ME)R* to the appropriate authority.

Figure 4. Classification breakdown of RTE reports, September to November 2014 (n = 1692)

* NB. IR(ME)R Regulation 4(5) requires all patient exposures deemed much greater than intended be reported to the appropriate authority.
Reportable radiation incident

Reportable radiation incidents as defined in *Towards Safer Radiotherapy*\(^2\) fall into the category of reportable under one of two statutory instruments – IR(ME)R\(^8\) or IRR99\(^9\). These incidents will generally be clinically significant, although they may be correctable within the course of treatment. The majority of these higher level incident reports affected only one fraction of treatment. This meant that corrective action could be taken over the remaining treatment fractions so the incident did not have a significant impact on the patient or the outcome of their treatment.

There were 27 reportable radiation incidents submitted to the voluntary system between September and November 2014, comprising 1.6% of the RTEs reviewed. This is a slight increase from 1.2% (n = 18) at the previous analysis. Of these radiation incidents, 12 (44.4%) occurred during treatment unit processes (Figure 5).

![Bar chart](image)

Figure 5. Breakdown of reportable radiation incidents (level 1) reported, September to November 2014 (n = 27)

Further analysis of the reports indicates the points in the pathway at which the reportable incidents occurred (Figure 6). Pretreatment ‘localisation of intended volume’ comprised 18.5% (n = 5) of all reportable radiation incidents reported for this time period. An example of this type of report includes simulating the left supraclavicular fossa instead of the right supraclavicular fossa.
Figure 6. Breakdown of reportable radiation incidents (level 1) by process subcode reported, September to November 2014 (n = 27)

Non-reportable radiation incident

Radiation incident not reportable, but of potential or actual clinical significance

Non-reportable radiation incidents comprised 1.0% (n = 16) of the RTEs reported between September and November 2014 (Figure 7). Of these RTEs, 68.7% (n = 11) occurred during treatment unit processes.

Figure 7. Breakdown of non-reportable radiation incidents (level 2) reported, September to November 2014 (n = 16)
Further analysis indicates the points in the pathway at which non-reportable radiation incidents occurred (Figure 8). ‘On-set imaging: approval process’ at 12.5% (n = 2) was the most frequently occurring event within the non-reportable radiation incidents, with an even distribution across 14 other subcodes. An example of this type of report includes an incorrect online image match leading to digital moves in an incorrect direction.

Figure 8. Breakdown of non-reportable radiation incidents (level 2) by process subcode reported, September to November 2014 (n = 16)

Minor radiation incident

Radiation incident in the technical sense, but of no potential or actual clinical significance\(^2\)

Minor radiation incidents comprised 30.2% (n = 511) of the RTEs reported between September and November 2014. Consistent with previously analysed data, the most frequently reported RTEs in this group were associated with treatment unit processes (77.7%, n = 397). RTE reports included 12 different codes within this classification, three of which are represented in the miscellaneous category (Figure 9).

The top 10 most frequently occurring level 3 process subcodes (Figure 10) incorporated mainly treatment unit process, with one subcode from pretreatment ‘documentation of instruction’ (2.2%, n = 11) and one from data entry ‘accuracy of data entry’ (2.5%, n = 13). Issues 8 and 2 respectively of Safer Radiotherapy\(^2\) include guidance on minimising the risk of occurrence of these RTEs.

A further breakdown of the treatment unit processes indicates the points in the pathway where the minor radiation incidents occurred. The top three most frequently occurring events within this treatment subset of minor radiation incidents were image associated errors. ‘On-set imaging: production process’ was the most frequently occurring event (26.0%, n = 133). The second most frequently occurring event within this subset was ‘use of on-set imaging’ (13.5%, n = 69), followed by ‘on-set imaging:
approval process’ (9.0%, n = 46). Issue 7 of Safer Radiotherapy\textsuperscript{10} includes guidance on the application of the on-set imaging process coding. An example of an ‘on-set imaging: production process’ report was an imager faulting part way through imaging, resulting in the need to carry out an additional exposure.

Figure 9. Breakdown of minor radiation incidents (level 3) reported, September to November 2014 (n = 511)

Figure 10. Breakdown of most frequently occurring minor radiation incidents (level 3) by process subcode reported, September to November 2014 (n = 392/511 subset of RTEs)
Near miss

*Potential radiation incident that was detected and prevented before treatment delivery*²

Near misses comprised 28.4% (n = 481) of the RTEs reported between September and November 2014. RTE reports included 17 different codes within this classification, eight of which are represented in the miscellaneous category (Figure 11).

![Bar chart showing breakdown of near misses (level 4) reported, September to November 2014 (n = 481)](image)

**Figure 11. Breakdown of near misses (level 4) reported, September to November 2014 (n = 481)**

![Bar chart showing breakdown of the most frequently occurring near misses (level 4) by process subcode reported, September to November 2014 (n = 228/481 subset of RTEs)](image)

**Figure 12. Breakdown of the most frequently occurring near misses (level 4) by process subcode reported, September to November 2014 (n = 228/481 subset of RTEs)**
The top most frequently occurring subcodes are presented in Figure 12. The most frequently occurring process subcodes across this level of RTE were pretreatment ‘documentation of instructions’ (8.1%, n = 39), followed by treatment ‘use of on-set imaging’ (7.7%, n = 37). An example of a report containing ‘documentation of instructions’ includes the incomplete documentation of patient set up details.

A total of 23 different treatment unit subcodes from process code 13 were reported in this classification. Imaging associated errors made up 57.2% (n = 79) of these treatment unit process subcodes.

**Other non-conformance**

*Non-compliance with some other aspect of a documented procedure, but not directly affecting radiotherapy delivery*

‘Other non-conformance’ comprised 38.8% (n = 657) of the RTEs reported between September and November 2014. RTE reports varied across the patient pathway including 19 different codes within this classification, nine of which are represented in the miscellaneous category.

![Figure 13. Breakdown of non-conformances (level 5) reported, September to November 2014 (n = 657)](image)

The most frequently occurring process code was the pretreatment planning processes, accounting for 19.3% (n = 127) of the reports in this classification (Figure 13).
The most frequently occurring subcodes are presented in figure 14, the most frequently occurring subcode was ‘bookings made according to protocol’ (7.9%, \(n = 52\)) followed by ‘management of process flow within planning’ (5.6%, \(n = 37\)). Issue 5 of *Safer Radiotherapy* includes guidance on minimising the risk of this RTE occurring. An example of a report containing ‘booking made according to protocol’ includes booking patients onto incorrect treatment machines.

![Figure 14. Breakdown of the most frequently occurring non-conformances (level 5) by process subcode reported, September to November 2014 (n = 261/657 subset of RTEs)](image)

**Secondary process coding**

A total of 29.5% (\(n = 499\)) of RTE reports submitted this quarter contained secondary process coding, indicating a second point in the pathway where the original error had gone undetected. This demonstrates a slight decrease from previous analyses. Some 45.9% (\(n = 229\)) of these RTEs were coded as end of process checks, as shown in Figure 15.

![Figure 15. Breakdown of the top five secondary process codes reported, September to November 2014 (n = 273/499 subset of RTEs)](image)
End of process checks

The ‘end of process check’ subcode is repeated across the radiotherapy pathway. A breakdown of the dataset by ‘end of process check’ process subcode was undertaken. It includes process subcodes 10l, 11t, 12g and 13hh (Figure 16). Advice on minimising the occurrence of RTEs related to end of process checking is given in issue 4 of Safer Radiotherapy11. A total of 17.4% (n = 294) of the RTEs reported were not captured during ‘end of process checks’. This would seem to suggest that the ‘end of process checks’ are failing to detect RTEs in some cases.

Figure 16. Breakdown of ‘end of process checks’ by point in the radiotherapy pathway reported, September to November 2014 (n = 294)

Breakdown of process codes

The 1692 RTE reports were categorised by process code (Figure 17) according to TSRT irrespective of classification, so that the main themes could be derived.

Figure 17 shows 40% (n = 669) of the RTEs reported were associated with treatment unit processes. This is to be expected as some radiotherapy treatments may span a number of visits providing many opportunities during the treatment unit process for RTEs to occur.

The 10 most frequently reported process subcodes in the radiotherapy pathway are presented in Figure 18. The most commonly occurring RTE reported was ‘on-set imaging: production process’ at 8.9% (n = 151) of the total number of reports, of note over half of these reports were associated with equipment malfunction (58.3%, n = 88). This was followed by ‘use of on-set imaging’ at 7.4% (n = 126) and ‘on-set imaging: approval process’ at 4.6% (n = 78). Of note, eight of these most commonly occurring RTEs included no incidents classified as reportable.
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Figure 17. Breakdown of RTE main activity codes reported, September to November 2014 (n = 1692)

Figure 18. Breakdown of RTE main themes by classification level reported, September to November 2014 (n = 760/1692 subset of RTEs)
References


