Safer Radiotherapy
The radiotherapy newsletter of Public Health England

Supplementary Data Analysis
Issue 13 – Full quarterly radiotherapy error data analysis
March 2014 to May 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 advocacy, partnerships, world-class science, knowledge and intelligence, 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
March 2014 to May 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 were submitted from England and Wales to the National Reporting and Learning System (NRLS) using the TSRT9 trigger code\(^1\), and from the Scottish Radiotherapy Programme Board in 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 March and May 2014, 49 NHS RT departments submitted RTE reports using the TSRT9 trigger code, representing more than three-quarters of departments from across the UK. The number of participating departments has slightly decreased from 84.7% at the last analysis (December 2013 to February 2014) to 83.1% within this reporting period. However, as of this reporting period, every UK NHS RT provider has participated in this initiative and has submitted RTEs for inclusion in the national analysis. This 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 296 days, with a mean of 58 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.

*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). This is mirrored in the steady growth in the total number of RTEs contributing to the national analysis, as seen in Figure 2, when compared with the earliest reporting periods.

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. This has grown over the past 12 months from an average of 322 reports per month to 477 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 1269 of the 1432 RTEs received between March and May 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 1269 RTE reports classified and coded, a 84.4% level of consistency was achieved (Figure 3). This demonstrates a decrease from the last analysis (92.5%), which may be due to new departments contributing to this issue. The Good Practice in Radiotherapy Error Reporting – Supplementary Guidance Series, which gives examples of the application of the classification and process coding, is available on the website. In addition, 149 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% of the total number of reports for this reporting period. Data and accompanying text indicate that they 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, 1418 RTEs for the reporting period from March to May 2014 were included for analysis. The analysis is presented here.
Figure 3. Breakdown of reports, March to May 2014 (n = 1432)

Classification of radiotherapy errors

Each of the 1418 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, 96.5% (n = 1369) were minor radiation, near miss or other non-conformities with little or no impact on patient outcome. Of the remaining 3.5% (n = 49) of RTE reports, only 1.9% (n = 27) were reportable under IR(ME)R\(^8\) to the appropriate authority.

Figure 4. Classification breakdown of RTE reports, March to May 2014 (n = 1418)

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

Reportable radiation incidents as defined in *Towards Safer Radiotherapy*² fall into the category of reportable under one of two statutory instruments – IR(ME)R⁸ or IRR99⁹. 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 IR(ME)R reportable radiation incidents submitted to the voluntary system between March and May 2014, comprising 1.9% of the RTEs reviewed. This is a slight increase from 1.2% at the previous analysis. Eighteen (66.6%) of these radiation incidents occurred during treatment unit processes (Figure 5).

![Figure 5. Breakdown of reportable radiation incidents (Level 1) reported, March to May 2014 (n = 27)](image)

Further analysis of the treatment unit process reports indicates the points in the pathway at which the reportable incidents occurred (Figure 6). ‘on-set imaging production process’ comprised 22.2% (n = 6) and ‘use of on-set imaging’ and ‘movement from reference marks’ each comprised 14.8% (n = 4) of all reportable radiation incidents reported for this time period.
Figure 6. Breakdown of treatment unit process reportable radiation incidents (Level 1) by activity code, March to May 2014 (n = 18)

Non-reportable radiation incident

*Radiation incident not reportable, but of potential or actual clinical significance*<sup>2</sup>

Non-reportable radiation incidents comprised 1.6% (n = 22) of the RTEs reported between March and May 2014 (Figure 7). Of these RTEs, 68.2% (n = 15) occurred during treatment unit processes.

Figure 7. Breakdown of non-reportable radiation incidents (Level 2) reported, March to May 2014 (n = 22)
Further analysis of the treatment unit processes indicates the points in the pathway at which non-reportable radiation incidents occurred (Figure 8). ‘On-set imaging: approval process’ and ‘use of on-set-imaging’ (equally 13.6%, n = 3) were the most frequently occurring events within this subset of non-reportable radiation incidents.

![Figure 8. Breakdown of treatment unit process non-reportable radiation incidents (Level 2) by activity code reported, March to May 2014 (n = 15)](image)

**Minor radiation incident**

*Radiation incident in the technical sense, but of no potential or actual clinical significance*²

Minor radiation incidents comprised 33.2% (n = 471) of the RTEs reported between March and May 2014. Consistent with previously analysed data, the most frequently reported RTEs in this group were associated with treatment unit processes (74.1%, n = 349, Figure 9).

A further breakdown of the treatment unit processes indicates the points in the pathway where the minor radiation incidents occurred (Figure 10). The top three most frequently occurring events within this subset of minor radiation incidents were image associated errors. ‘Use of on-set imaging’ was the most frequently occurring event (26.3%, n = 124). The second most frequently occurring event within this subset was ‘on-set imaging: production process’ (12.1%, n = 57), followed by ‘on-set imaging: approval process’ (7.6%, n = 36). Issue 7 of *Safer Radiotherapy*¹⁰ includes guidance on the application of the on-set imaging process coding. The increase in these minor radiation incident events may be due to increased uptake in image guided radiotherapy. Further breakdown of imaging associated reports can be found in Issue 12 of *Safer Radiotherapy*¹¹.
Figure 9. Breakdown of minor radiation incidents (Level 3) reported, March to May 2014 (n = 468/471 subset of RTEs)

Figure 10. Breakdown of the most frequently occurring treatment unit process minor radiation incidents (Level 3) by activity code reported, March to May 2014 (n = 323/349 subset of RTEs)
Near miss

Potential radiation incident that was detected and prevented before treatment delivery

Near misses comprised 27.9% (n = 396) of the RTEs reported between March and May 2014. RTE reports included 17 different codes within this classification. Only the top 10 most frequently occurring codes are presented in Figure 11, which includes 97.5% (n = 386) of the total number of RTE reports within the Level 4 reports submitted.

Figure 11. Breakdown of the most frequently occurring near misses (Level 4) reported, March to May 2014 (n = 386/396 subset of RTEs)

Figure 12. Breakdown of the most frequently occurring treatment unit process near misses (Level 4) by activity code reported, March to May 2014 (n = 113/137 subset of RTEs)
A total of 24 different treatment unit process sub-codes from process code 13 were reported in this classification. The top 10 most frequently occurring process sub-codes are presented in Figure 12, which make up 82.5% (n = 113) of the RTEs reported under process code 13 within this classification. Imaging associated errors made up 55.4% (n = 76) of these treatment unit process sub-codes.

**Other non-conformance**

*Non-compliance with some other aspect of a documented procedure, but not directly affecting radiotherapy delivery*²

‘Other non-conformance’ comprised 35.4% (n = 502) of the RTEs reported between March and May 2014. RTE reports varied across the patient pathway including 19 different codes within this classification.

![Image of bar chart](Figure 12. Breakdown of the most frequently occurring non-conformances (Level 5) reported, March to May 2014 (n = 461/502 subset of RTEs))

The most frequently occurring process code was the pre-treatment planning processes, accounting for 29.3% (n = 147) in this classification (Figure 13). The most frequently occurring pre-treatment planning process was ‘management of process flow within planning’ at 15.1% (n = 76), as seen in Figure 14.
Secondary process coding

A total of 34.9\% (n = 496) 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 40.5\% (n = 201) of these RTEs were coded as end of process checks, as shown in Figure 15. The most commonly occurring secondary process code was ‘on set imaging; production process’ with 21.1\% (n = 105) of the total secondary process codes. This may be due to the increase in imaging associated errors.

Figure 15. Breakdown of the top five secondary process codes, March to May 2014 (n = 300/496 subset of RTEs)
End of process checks

The ‘end of process check’ sub-code is repeated across the radiotherapy pathway. A breakdown of the dataset by ‘end of process check’ process sub-code was undertaken. It includes process sub-codes 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 Radiotherapy*. A total of 16.3% (n = 231) 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, March to May 2014 (n = 1418)](image)

Breakdown of process codes

The 1418 RTE reports were categorised by process code (Figure 17) and then by process sub-code (Figure 18) according to TSRT irrespective of classification, so that the main themes could be derived.

Figure 17 shows 42% (n = 597) 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 sub-codes in the radiotherapy pathway are presented in Figure 18. The most commonly occurring RTEs reported was ‘use of on-set imaging’ at 11.6% (n = 165) of the total number of reports. This was followed by ‘management of process flow within planning’ code at 5.4% (n = 77) and ‘on-set imaging: production process’ at 5.1% (n = 73). Of note, six of these most commonly occurring RTEs included no incidents classified as reportable.
Figure 17. Breakdown of RTE main activity codes reported, March to May 2014 (n = 1418)

Figure 18. Breakdown of RTE main themes by classification level reported, March to May 2014 (n = 663/1418 subset of RTEs)
References

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