Safer Radiotherapy
The radiotherapy newsletter of Public Health England

Supplementary Data Analysis
Issue 18 – Full radiotherapy error data analysis
August to November 2015
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 radiotherapy error data analysis
August to November 2015

This analysis has been undertaken by Public Health England (PHE) on radiotherapy errors and near misses (RTEs) reported voluntarily by NHS radiotherapy providers. Reports are submitted from England and Wales to the National Reporting and Learning System (NRLS) of NHS England using the TSRT9 trigger code¹, and directly to PHE from providers in Northern Ireland and Scotland.

The classification and process coding from Towards Safer Radiotherapy² (TSRT) was employed for the analysis. Where appropriate, comparisons have been drawn with previous issues of Safer Radiotherapy³ and the PHE supplementary data analyses⁴. The analysis has been reviewed by the Patient Safety in Radiotherapy Steering Group, whose comments have been incorporated into this document.

Between August and November 2015, 55 NHS radiotherapy providers submitted RTE reports using the TSRT9 trigger code, representing the vast majority of providers from across the UK. The percentage of participating providers at 91.7% (n = 55 out of 60) is similar to that for the previous two reporting periods. The number of providers contributing to each issue of Safer Radiotherapy and the supplementary data analysis series is illustrated in Figure 1. New and existing NHS radiotherapy providers are welcome to contact PHE for advice on how to submit data for inclusion in these series of reports.

![Figure 1. Number of radiotherapy providers contributing to each issue of Safer Radiotherapy and the supplementary data analysis](image)

Figure 1. Number of radiotherapy providers contributing to each issue of Safer Radiotherapy and the supplementary data analysis
The average number of reports received by PHE continues to increase, reaching 622 for this reporting period (Figure 2). A mature reporting culture is reflected in the continued participation in reporting by a large number of providers and in the increase in the number of reports submitted for analysis. This continued commitment of providers demonstrates the community’s drive to improve patient safety in radiotherapy.

However, it is clear that there is some disparity in the regularity of reporting, with a wide variance shown when comparing the date of an incident with the date it is reported to the national voluntary reporting scheme. This time lag ranges from a minimum of 1 day to a maximum of 255 days for this reporting period, with a mean of 60 days. This is an improvement when compared to the last reporting period (a mean of 65 days). To ensure timely learning from RTE reports continues to be shared nationally, providers are asked to make submissions at the earliest opportunity for inclusion in the monthly data uploads by PHE and the four-monthly analyses. Issue 13^3 of Safer Radiotherapy provides further information on the frequency of reporting.

The analysis presented in this report will help local departments to compare identified trends against the national picture. In doing so it is expected that these events might be minimised in the future.

Please note that providers contributing to the national analysis are allocated a unique identifier in order to anonymise the data received by PHE.

Figure 2. Monthly average number of incident reports contributing to each issue of Safer Radiotherapy and the supplementary data analysis
Monitoring of TSRT classification and coding by radiotherapy providers

The TSRT classification and coding had been applied by local radiotherapy providers to 2156 of the 2488 reports received between August and November 2015. This demonstrates a continuation of the high adoption rate (86.7%) in the application of the TSRT taxonomies.

Consistency checking was undertaken by PHE staff on the application of the TSRT classification and coding system by radiotherapy providers. Up to four individual pathway codes can be allocated locally by radiotherapy departments to each RTE report. During consistency checking each of these pathway codes and the classification are reviewed. From the 2156 RTE reports classified and coded locally, an 80.5% level of consistency was achieved (Figure 3). The *Good Practice in Radiotherapy Error Reporting – Supplementary Guidance Series* gives examples of the application of the classification and process coding. In addition, 306 RTEs were classified or 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 classification and coding.

![Figure 3. Breakdown of reports, August to November 2015 (n = 2488)](image)

All providers are asked to apply a trigger code, classification and coding to their RTE reports to facilitate both local and national analysis.

Non-RTE reports submitted with the TSRT9 trigger code formed 0.8% (n = 21) of all the 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*\(^3\). The non-RTE reports were excluded from the detailed analysis. Seven reports were not classified and coded and did not contain sufficient text for PHE staff to do so and were also excluded from the analysis.

In total, 2460 RTEs for the reporting period from August to November 2015 were included for analysis. The analysis is presented here.

### Classification of radiotherapy errors

Each of the 2460 RTE 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, 96.4\% (n = 2371) were minor radiation, near miss or other non-conformities with little or no impact on patient outcome. Of the remaining 3.6\% (n = 89) RTE reports, only 2.2\% (n = 55) were reportable under IR(ME)R\(^6\) to the appropriate authority. It was reported in a national survey\(^7\) that providers are more likely to submit RTE reports of higher classification levels (levels 1–3) to the national voluntary reporting system. RTE reports of lower classification are less likely to be shared owing to resource constraints.

![Figure 4. Classification breakdown of RTE reports, August to November 2015 (n = 2460)](image)

* It should be noted that 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* fall into the category of reportable under one of two statutory instruments – IR(ME)R or IRR99. 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 a single 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 55 reportable radiation incidents submitted to the voluntary system between August and November 2015, comprising 2.2% of the RTEs reviewed. This is a slight increase from 1.8% (n = 41) for the previous four-monthly analysis. Of these radiation incidents, 31 (56.4%) occurred during treatment unit processes (Figure 5).

Figure 5. Breakdown of reportable radiation incidents (level 1) reported, August to November 2015 (n = 55)

Further analysis of the reports indicates the points in the pathway at which the reportable incidents occurred (Figure 6). ‘Authorisation to irradiate’ and ‘on-set imaging: production process’ each comprised 10.9% (n = 6) of the RTEs and were the most frequently occurring process subcodes of all reportable radiation incidents reported for this time period. There is some variance in the classification of errors attributed to the ‘on-set imaging: production process’, which can be dependent on the local procedures in departments. In the near future guidance on reporting exposures relating to pretreatment imaging and treatment imaging will be published, which should aid the consistency of the classification of these errors; this is discussed further in issue 18 of
Safer Radiotherapy\(^3\). Guidance on minimising errors associated with ‘authorisation to irradiate’ are discussed in the ‘Error of the Month’ in that issue.

Treatment ‘ID of reference marks’ comprised 9.1% (n = 5) of the RTEs and ‘movements from reference marks’ comprised 7.3% (n = 4). Pretreatment ‘localisation of intended volume’, treatment ‘patient data ID process’ and ‘patient positioning’ each comprised 5.5% (n = 3) of the reportable RTEs. The remaining reports were spread across 19 different subcodes, 13 of which were singular events. They are grouped in Figure 6 as miscellaneous.

![Figure 6. Breakdown of reportable radiation incidents (level 1) by process subcode reported, August to November 2015 (n = 55)](image)

Non-reportable radiation incident

*Radiation incident not reportable, but of potential or actual clinical significance*\(^2\)

Non-reportable radiation incidents comprised 1.4% (n = 34) of the RTEs reported between August and November 2015 (Figure 7). Of these RTEs, 64.7% (n = 22) occurred during treatment unit processes.

Further analysis indicates the points in the pathway at which non-reportable radiation incidents occurred (Figure 8). ‘On-set imaging: approval process’ at 29.4% (n = 10) was the most frequently occurring event within the non-reportable radiation incidents, consistent with the previous analysis. Guidance to minimise the likelihood of occurrence
of this error can be found in issue 3 of *Safer Radiotherapy*. ‘On-set imaging: production process’ comprised 11.8% (n = 4), followed closely by ‘setting of treatment machine parameters’ at 8.8% (n = 3) and ‘accuracy of data entry’ at 5.9% (n = 2) of all non-reportable radiation incidents. The remaining reports were spread across 15 different subcodes, all of which were singular events. They are grouped in Figure 8 as miscellaneous.

**Figure 7. Breakdown of non-reportable radiation incidents (level 2) reported, August to November 2015 (n = 34)**

**Figure 8. Breakdown of non-reportable radiation incidents (level 2) by process subcode reported, August to November 2015 (n = 34)**
Minor radiation incident

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

Minor radiation incidents comprised 30.9\% \((n = 759)\) of the RTEs reported between August and November 2015. Consistent with previously analysed data, the most frequently reported RTEs in this group were associated with treatment unit processes \((76.0\%, n = 577)\). RTE reports included 14 different codes within this classification, 6 of which are represented in the miscellaneous category (Figure 9).

![Figure 9. Breakdown of minor radiation incidents (level 3) reported, August to November 2015 \((n = 759)\)](image)

The top 10 most frequently occurring level 3 process subcodes (Figure 10) incorporated mostly treatment unit processes, with one subcode from pretreatment activities ‘documentation of instructions’ \((3.0\%, n = 23)\) and one subcode from pretreatment ‘accuracy of data entry’ \((2.5\%, n = 19)\). Issues 8 and 2, respectively, of *Safer Radiotherapy*\(^3\) include guidance on minimising the risk of occurrence of these RTEs.

The three most frequently occurring events within the treatment subset of minor radiation incidents were imaging associated errors. ‘On-set imaging: production process’ was the most frequently occurring event \((31.8\%, n = 241)\). The second most frequently occurring event within this subset was ‘on-set imaging: approval process’ \((9.0\%, n = 68)\), followed by ‘use of on-set imaging’ \((6.7\%, n = 51)\). Of interest, 52.0\% \((n = 394)\) of the reports in this classification were related to on-set imaging. A number of level 3 RTEs with the primary code ‘on-set imaging: production process’ were attributed to equipment malfunction \((15.4\%, n = 117)\). Malfunction of equipment is discussed further in issue 18 of *Safer Radiotherapy*\(^3\).
Figure 10. Breakdown of most frequently occurring minor radiation incidents (level 3) by process subcode reported, August to November 2015 (n = 533/759 subset of RTEs)

Near miss

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

Near misses comprised 29.2% (n = 719) of the RTEs reported between August and November 2015. RTE reports included 19 different codes within this classification, 10 of which are represented in the miscellaneous category (Figure 11).

Figure 11. Breakdown of near misses (level 4) reported, August to November 2015 (n = 719)
The most frequently occurring process subcodes across this level of RTE were ‘on-set imaging: approval process’ (10.3%, n = 74) followed by pretreatment ‘documentation of instructions’ (7.5%, n = 54) (Figure 12).

**Figure 12. Breakdown of the most frequently occurring near misses (level 4) by process subcode reported, August to November 2015 (n = 386/719 subset of RTEs)**

**Other non-conformance**

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

‘Other non-conformance’ comprised 36.3% (n = 893) of the RTEs reported between August and November 2015. RTE reports varied across the patient pathway including 20 different codes within this classification, 11 of which are represented in the miscellaneous category (Figure 13).

The most frequently occurring process code was ‘pretreatment planning process’, accounting for 21.9% (n = 196) of the reports in this classification (Figure 13), which is an increase from the previous data analysis (16.6%, n = 142) where the most frequently occurring process code was ‘treatment unit process’. Further analysis of the pretreatment planning process codes can be found in Figure 14.

The most frequently occurring subcodes were ‘bookings made according to protocol’ (6.3%, n = 56), followed by ‘documentation of instructions’ and ‘generation of plan for approval’ (both at 4.0%, n = 36) (Figure 15). Issue 17 of *Safer Radiotherapy* includes guidance on minimising the occurrence of RTEs associated with ‘bookings made according to protocol’. Issue 8 gives guidance on ‘documentation of instructions’ and issue 15 on ‘generation of plan for approval’.
Figure 13. Breakdown of non-conformances (level 5) reported, August to November 2015 \((n = 893)\)

Figure 14. Breakdown of pretreatment planning process codes for non-conformances (level 5) by process subcode reported, August to November 2015 \((n = 196/893\) subset of RTEs)
Figure 15. Breakdown of the most frequently occurring non-conformances (level 5) by process subcode reported, August to November 2015 (n = 320/893 subset of RTEs)

Secondary process coding

A total of 48.4% (n = 1191) of RTEs submitted contained secondary process coding, indicating a second point in the pathway where the original error had gone undetected. This is a considerable increase from the previous analysis (27.3%, n = 628); however, 405 process subcodes were added by PHE staff in this analysis compared to 8 from the previous analysis. ‘End of process checks’ on the treatment unit was the most commonly reported secondary process code at 23.5% (n = 280) (Figure 16). The introduction of the use of safety barriers (SB), as part of the refinement of the TSRT pathway coding will encourage the reporting of secondary process codes to provide information about failing and successful SBs within radiotherapy. It is expected that this will contribute to the development of learning from RTEs. It is encouraging that there has been an increase from 31.4% in the previous analysis to 36.5% in the application of secondary codes by local providers.

End of process checks

The ‘end of process checks’ subcode is repeated across the radiotherapy pathway. A breakdown of the dataset by ‘end of process checks’ process subcode was undertaken. It includes process subcodes 9k, 10l, 11t, 12g and 13hh (Figure 17).

Advice on minimising the occurrence of RTEs related to ‘end of process checks’ is given in issue 4 of Safer Radiotherapy. A total of 34.6% (n = 850) of the RTEs reported were not captured during ‘end of process checks’, occurring most frequently at the treatment unit processes.
Breakdown of process codes

The 2460 RTE reports were categorised by process code (Figure 18) according to TSRT irrespective of classification, so that the main themes could be derived. Figure 18 shows 42.8% (n = 1054) 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 most frequently reported process subcodes in the radiotherapy pathway are presented in Figure 19. This subset of data was also broken down by classification. The most commonly occurring RTE reported was ‘on-set imaging: production process’ at 11.3% (n = 278) of all the reports. Of note, 86.7% of these reports were level 3 events.
This was followed by ‘on-set imaging: approval process’ at 7.0% (n = 172) and ‘documentation of instructions’ at 4.6% (n = 113).

*If individual providers would like to comment on the analysis or can offer further advice in preventing any RTEs please email the radiotherapy team at radiotherapy@phe.gov.uk.*
References


2. *Towards Safer Radiotherapy*. Available at www.rcr.ac.uk/towards-safer-radiotherapy


