Safer Radiotherapy
The radiotherapy newsletter of Public Health England

Supplementary Data Analysis
Issue 17 – Full radiotherapy error data analysis
April to July 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
April to July 2015

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

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

Between April and July 2015, 55 NHS RT 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 the previous reporting period. The number of providers contributing to each issue of Safer Radiotherapy and the supplementary data analysis series is illustrated in Figure 1. New radiotherapy providers are welcome to contact PHE for advice on how to submit data.

The average number of reports received by PHE continues to increase, reaching 581 for this reporting period (Figure 2). A mature reporting culture is reflected in the continued participation in reporting by a large numbers of providers and in the increase in the numbers 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 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 318 days for this reporting period, with 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 tri-annual analyses. Issue 13 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 shared received at PHE.
Figure 1. Number of radiotherapy providers contributing to each issue of *Safer Radiotherapy* and the supplementary data analysis

Figure 2. Monthly average number of incident reports contributing to each issue of *Safer Radiotherapy* and the supplementary data analysis

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Monitoring of TSRT classification and coding by RT providers

The TSRT classification and coding had been applied by local RT providers to 1980 of the 2322 reports received between April and July 2015. This demonstrates a continuation of the high adoption rate (85.3%) 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 RT 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 1980 RTE reports classified and coded locally, an 88.0% 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\(^5\). In addition, 342 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 coding and classification\(^3\).

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

Figure 3. Breakdown of reports, April to July 2015 (n = 2322)

Non-RTE reports submitted with the TSRT9 trigger code formed 0.6% (n = 14) 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. Four 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, 2304 RTEs for the reporting period from April to July 2015 were included for analysis. The analysis is presented here.

**Classification of radiotherapy errors**

Each of the 2304 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, 96.5% (n = 2224) were minor radiation, near miss or other non-conformities with little or no impact on patient outcome. Of the remaining 3.5% (n = 80) RTE reports, only 1.8% (n = 41) were reportable under IR(ME)R6* to the appropriate authority. It was reported in a national survey7 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.

* 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.

**Figure 4. Classification breakdown of RTE reports, April to July 2015 (n = 2304)**

**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)R6 or IRR998. 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.

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* Image of bar chart showing the distribution of RTE reports.
There were 41 reportable radiation incidents submitted to the voluntary system between April and July 2015, comprising 1.8% of the RTEs reviewed. This is a slight decrease from 2.5% (n = 46) at the previous four-month analysis. Of these radiation incidents, 19 (46.3%) occurred during treatment unit processes (Figure 5).

Further analysis of the reports indicates the points in the pathway at which the reportable incidents occurred (Figure 6). ‘Movements from reference marks’ comprised 12.2% (n = 5) and was the most frequently occurring process subcode of all reportable radiation incidents reported for this time period. This continues to be a frequently reported RTE across classification levels 1–3. Issue 2 of Safer Radiotherapy\(^3\) includes guidance on minimising the risk of occurrence of these RTEs.

Pretreatment ‘production of images demonstrating correct detail’ and treatment ‘ID of reference marks’ each comprised 9.8% (n = 4). The remaining reports were spread across 22 different subcodes, 14 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, April to July 2015 (n = 41)

Non-reportable radiation incident

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

Non-reportable radiation incidents comprised 1.7% (n = 39) of the RTEs reported between April and July 2015 (Figure 7). Of these RTEs, 51.3% (n = 20) 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 12.8% (n = 5) was the most frequently occurring events within the non-reportable radiation incidents. This was followed by ‘commissioning’ at 10.3% (n = 4). An example of a report containing ‘commissioning’ includes data measured correctly at commissioning but data tables not updated to reflect new data, leading to incorrect patient treatment. The remaining reports were spread across 25 different subcodes, 16 of which were singular events. They are grouped in Figure 8 as miscellaneous.

Minor radiation incident

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

Minor radiation incidents comprised 32.1% (n = 739) of the RTEs reported between April and July 2015. Consistent with previously analysed data, the most frequently reported RTEs in this group were associated with treatment unit processes (76.4%, n = 564). RTE reports included 14 different codes within this classification, 5 of which are represented in the miscellaneous category (Figure 9).
Figure 7. Breakdown of non-reportable radiation incidents (level 2) reported, April to July 2015 (n = 39)

Figure 8. Breakdown of non-reportable radiation incidents (level 2) by process subcode reported, April to July 2015 (n = 39)
The top 10 most frequently occurring level 3 process subcodes (Figure 10) incorporated mainly treatment unit processes, with one subcode from pretreatment ‘accuracy of data entry’ (2.4%, n = 18). Issue 2 of Safer Radiotherapy\(^3\) includes guidance on minimising the risk of occurrence of these RTEs.

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Figure 9. Breakdown of minor radiation incidents (level 3) reported, April to July 2015 (n = 739)

Figure 10. Breakdown of most frequently occurring minor radiation incidents (level 3) by process subcode reported, April to July 2015 (n = 538/739 subset of RTEs)
The three most frequently occurring events within this treatment subset of minor radiation incidents were imaging associated errors. ‘On-set imaging: production process’ was the most frequently occurring event (23.7%, n = 175). The second most frequently occurring event within this subset was ‘on-set imaging: approval process’ (10.1%, n = 75), followed by ‘use of on-set imaging’ (9.3%, n = 69). Of interest, 48.4% (n = 358) of the reports in this classification were related to on-set imaging. Issue 7 of Safer Radiotherapy includes guidance on the application of the on-set imaging process coding. An example of an ‘on-set imaging: production process’ report was the incorrect setting of jaws, not capturing the anatomy required for image matching, resulting in the need to carry out an additional exposure.

Near miss

Potential radiation incident that was detected and prevented before treatment delivery

Near misses comprised 27.3% (n = 628) of the RTEs reported between April and July 2015. RTE reports included 17 different codes within this classification, 8 of which are represented in the miscellaneous category (Figure 11).

The most frequently occurring process subcodes across this level of RTE were ‘accuracy of data entry’ (8.6%, n = 54) followed by pretreatment ‘documentation of instructions’ (8.4%, n = 53) (Figure 12).

![Figure 11. Breakdown of near misses (level 4) reported, April to July 2015 (n = 628)](image-url)
Other non-conformance

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

‘Other non-conformance’ comprised 37.2% (n = 857) of the RTEs reported between April and July 2015. The supplementary survey analysis, published in December 2014, highlighted that only 34.8% (n = 15) of providers submit non-conformances externally to the NRLS or directly to PHE. RTE reports varied across the patient pathway including 20 different codes within this classification, 11 of which are represented in the miscellaneous category.

The most frequently occurring process code was the treatment unit process, accounting for 23.3% (n = 199) of the reports in this classification (Figure 13).

The most frequently occurring subcodes were ‘management of process flow within planning’ (5.4%, n = 46), followed by ‘communication of appointments to patient’ (4.7%, n = 43) and ‘bookings made according to protocol’ (4.9% n = 42) (Figure 14). Issue 5 of *Safer Radiotherapy* includes guidance on minimising the occurrence of RTEs associated with ‘management of process flow within planning’. Issue 14 gives guidance on ‘communication of appointments to patient’.
Figure 13. Breakdown of non-conformances (level 5) reported, April to July 2015 (n = 857)

Figure 14. Breakdown of the most frequently occurring non-conformances (level 5) by process subcode reported, April to July 2015 (n = 351/857 subset of RTEs)
Secondary process coding

A total of 27.3% (n = 628) of RTE reports submitted contained secondary process coding, indicating a second point in the pathway where the original error had gone undetected. This is similar to previous analyses. Some 43.9% (n = 276) of these RTEs were coded as end of process checks, as shown in Figure 15.

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, 11l, 12g and 13hh (Figure 16).

Figure 15. Breakdown of the top five secondary process codes reported, April to July 2015 (n = 276/628 subset of RTEs)

Figure 16. Breakdown of ‘end of process checks’ by point in the radiotherapy pathway reported, April to July 2015 (n = 373)
Advice on minimising the occurrence of RTEs related to end of process checking is given in issue 4 of *Safer Radiotherapy*. A total of 16.2% (n = 373) 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. The introduction of the use of safety barriers, as part of the refinement of the TSRT pathway coding, might help identify where ‘end of process checks’ can be strengthened.

**Breakdown of process codes**

The 2304 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. Breakdown of RTE main activity codes reported, April to July 2015 (n = 2304)](image)

Figure 17 shows 40% (n = 922) 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. This subset of data was also broken down by classification. The most commonly occurring RTE reported was ‘on-set imaging: production process’ at 8.8% (n = 202) of all the reports. Of note, 86.6% of these reports were level 3 events. This was followed by ‘use of on-set imaging’ at 6.3% (n = 145) and ‘on-set imaging:
approval process’ at 6.2% (n = 142). Issue 163 of *Safer Radiotherapy* provides guidance on how to minimise events associated with ‘on-set imaging: production process’.

Figure 18. Breakdown of RTE main themes by classification level reported, April to July 2015 (n = 1026/2304 subset of RTEs)

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

1. Implementing Towards Safer Radiotherapy: guidance on reporting radiotherapy errors and near misses effectively. Available at www.nrls.npsa.nhs.uk/resources/clinical-specialty/radiology-and-radiotherapy/

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


