Safer Radiotherapy

Triannual RTE Analysis & Learning Report

Issue 31 – Full radiotherapy error data analysis December 2019 to March 2020
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Safer Radiotherapy

Full radiotherapy error data analysis
December 2019 to March 2020

This analysis was carried out by Public Health England (PHE) on radiotherapy errors and near-misses (RTE) reported voluntarily by NHS radiotherapy (RT) providers. Anonymised reports are submitted from England and Wales to the National Reporting and Learning System (NRLS) at NHS England and NHS Improvement using the TSRT9 trigger code\(^{(1)}\), and directly to PHE from providers in Northern Ireland and Scotland.

The classification from Towards Safer Radiotherapy\(^{(2)}\) (TSRT) and the pathway coding, including safety barriers (failed & effective) and causative factor taxonomy from the Development of learning from radiotherapy errors\(^{(3)}\) (DoL) were used for the analysis. Where appropriate, comparisons were drawn with previous issues of the PHE data analyses\(^{(4)}\). The analysis was reviewed and added to by the Patient Safety in Radiotherapy Steering Group (PSRT).

The fundamental role of reporting and learning reporting systems is to enhance patient safety by learning from failures of the healthcare system\(^{(5)}\). It is imperative errors and near-misses are learned and effective preventative measures are implemented\(^{(6)}\). The PSRT recommends learning from this analysis. This series of publications facilitate comparison of locally identified trends against the national picture. In doing so, it is expected that these events might be minimised in the future.

As with any voluntary reporting system, the data will only reflect those incidents that are reported and may not necessarily be representative of the actual level of occurrence. As such, this data needs interpreting with care.

There is a requirement for RT providers to notify the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R)\(^{(7-9)}\) inspectorates of all significant accidental or unintended exposures (SAUE) or ‘reportable radiation incidents’ (level 1), as defined in TSRT\(^{(2)}\).

The UK inspectorates for IR(ME)R, Care Quality Commission, Healthcare Inspectorate Wales, Healthcare Improvement Scotland and the Regulation and Quality Improvement Authority shared anonymised closed synopses of reported significant accidental or unintended exposures (SAUE) for analysis. The following case study was taken from these shared reportable radiation incidents.

If individual providers would like to comment on the analysis or share experience of learning from RTE, please email the RT team at radiotherapy@phe.gov.uk.
Case study 1 – verification of diagnosis/extent/stage

All patients will undergo some diagnostic interventions prior to referral for radiotherapy. These will generally include diagnostic imaging, histology and clinical examination. The intervention undertaken will depend on the suspected disease and affected anatomical site. The reports on these interventions are shared with the clinical oncologist as part of referral and justification and to inform radiotherapy planning and treatment processes.

Primary source records confirming the patient diagnosis should be available to the referrer and practitioner. Verification of the diagnosis of a patient prior to treatment is essential to ensure the justification of subsequent exposures are appropriate. The extent of the disease and the staging are also important to ensure the treatment plan is appropriate.

‘Verification of diagnosis/extent/stage’ is one of the most frequently reported level 1 RTE process subcodes within the voluntary data for this reporting period (Figure 7) making up 13.6% of all level 1 RTE. This has increased from 2.4% in Jan 2014 (Figure 1).

Figure 1. Trends for most frequent level 1 RTE by process subcode (Jan 10 – Dec 19)

Of the 300 SAUE reported between January 2018 to December 2019 to the IR(ME)R inspectorates, 19 were associated with ‘verification of diagnosis/extent/stage’. One of these reports is summarised below.
Case study 1 – Synopsis

Patient referred for and commenced chemo-radiotherapy for a suspected recurrent colorectal cancer. The referral guidelines for this patient group included CT scan with contrast and histology. However, a histology report was received 2 days after treatment started showing that the tumour was non-malignant. Treatment was immediately stopped and the patient informed.

This was assessed to be a referrer error as the patient was referred and treatment started before all necessary diagnostic information had been received. However, it is noted there is a responsibility on the practitioner to justify exposures as having a net benefit and this necessitates sufficient diagnostic information. In this case, the referrer and practitioner were the same individual.

Patient had previously been treated for rectal carcinoma (surgical resection) and re-presented with a rectal lesion on CT. Work-up around CT / PET-CT and MDT decision this was a ‘peri-rectal’ recurrence. A biopsy was requested prior to planning CT. Treatment was planned and authorised. Chemo-radiation treatment was prescribed and delivered. On day 3 of radiotherapy the biopsy result was made available. The result was noted and treatment suspended.

A review found the MDT decision to treat was based on 2 +ve imaging studies. A recurrence would be the 95-99% most likely cause for these appearances. However, given that a biopsy had been performed in this case, treatment should not have been started prior to biopsy results being available.

It was concluded this was a human error on the part of the clinical oncologist which was acknowledged. The plan signoff was performed in isolation of the patient notes, which is not normal practice. Procedures did not include any stop-steps or check-steps to remind the clinician to consider outstanding investigations or processes which may be of relevance to the initiation of treatment. The oncologist weighed up the net benefit of the treatment for the patient and was mindful of significant radiotherapy checking processes still to be completed prior to patient treatment commencing.

The patient received a copy of the report and an apology. The report was shared with the division. The department introduced an additional check-step on the template for radiotherapy final prescription approval. The check-step asks the prescribing clinician ‘are there any investigations or processes outstanding which may lead to this treatment no longer being necessary?’ A statement such as ‘I consider treatment should be initiated in the patient’s best interests regardless of any outstanding investigations’ was introduced in cases where results are not available or are delayed and it is in the patient’s best interest to progress with treatment.

Coding: TSRT9/ Level 1/4b /5a/ 11k/ MD13hh / CF1d/ CF2c / CF1c
Case study 1 – Root causes / Contributing factors:

- The root cause for this case study was identified as ‘communication’, due to the omission of the biopsy request on the referral
- Contributory factors included ‘adherence to procedure’. The local referral guidelines for this group of patients included the requirement to include diagnostic imaging and histology. The histology was missed at MDT. ‘Slips and lapses’ was another contributory factor. This was evidenced in the perceived pressure to get the patient’s radiotherapy started and avoid any unnecessary delay

Case study 1 – Corrective actions:

- An audit of confirmation of diagnosis of patients should be undertaken to ensure other patients are not similarly affected
- A review of access to primary source diagnostic reports should be undertaken. Consideration might be given to where these are made available to the referrer and practitioner – e.g. MDT meeting room, clinics, areas where radiotherapy localisation or planning occurs
- Consideration should be given to reviewing access to primary source data from outlying clinics and referring centres
- A review of referral guidelines to ensure these are appropriate for each treatment site should be completed
- A review of the stop checks or pause and check should be carried out; further guidance is available\(^{(10)}\)
- Consideration should be given to provision of training on the role of the referrer and practitioner

Case study 1 – Learning from excellence:

1. Patient referrals for radical radiotherapy should include a diagnosis confirmed by histopathology and diagnostic imaging. Where histology is not possible and in the cases of patients referred for palliative radiotherapy, it may be more appropriate to confirm diagnosis by diagnostic imaging and physical examination. This required information should be included within clinical protocols specified by anatomical site. It is not safe to rely on sources of information other than the above. The primary source documents or copies should be available throughout the radiotherapy process, particularly at critical points such as planning and completion of prescription.
2. Referral pathways should be reviewed and ICT optimised to make reports available to the referrer and practitioner in areas such as new patient clinics, MDT meeting rooms and treatment localisation and planning rooms.
3. A review of referral guidelines and procedures is proposed to make sure that all required diagnostic information is in place prior to treatment justification and authorisation, and made available to inform planning processes to minimise the risk of a missed verification of diagnosis / staging of disease.

4. Where possible, verification of diagnosis should be a mandatory field in radiotherapy referral forms.

5. Annual IR(ME)R update training on roles and responsibilities should be carried out.

Number of RTE reports

The average number of reports received by PHE each month for this reporting period was 830.5. When compared to the last reporting period the average number of reports per month has decreased from 897.8 (decrease of 7.5%), while there was an increase seen when comparing to the same reporting period in 2018/2019 when 744.3 RTE (increase of 11.6%) were reported per month. A mature reporting culture is reflected in the continued participation by many providers in national reporting.

According to the Radiotherapy Dataset, the estimated number of attendances in NHS providers across England and Wales for this reporting period was 593,471.

Across England and Wales 3,226 RTEs were detected and reported by NHS providers, equating to 5 per 1,000 of all attendances for this reporting period; this is similar to the previous reporting period. Similar activity data is not yet available for an estimated reported error rate to be calculated for Northern Ireland and Scotland.

There is some disparity in frequency of reporting across providers, with a 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 0 days to a maximum of 651 days, with a mode of 14 days and a mean of 49 days.

This is a slight decrease in the mean since the last reporting period (mean = 53.7 days), however the mode remains the same at 14 days. This variance in timeliness of reporting is also reflected in the overall patient safety incident reports received by the NRLS.

To ensure timely learning from RTE nationally, providers are asked to make RTE submissions at the earliest opportunity. Issue 26 of Safer Radiotherapy provides further information on the frequency of reporting.
Monitoring of RTE coding by radiotherapy providers

All providers are asked to apply a trigger code, classification, coding, including failed and effective (method of detection) safety barriers and causative factor to their RTE reports to facilitate both local and national analysis. Failed and effective safety barriers and how to include them in report submissions are discussed further in Issue 24 and 28 of Safer Radiotherapy\(^{(13)}\).

Consistency checking was undertaken by PHE staff on the application of the RTE coding by RT providers. The coding was reviewed for all RTE classified as reportable through to near-miss (levels 1 – 4) and 10% of non-conformances (level 5) RTE were audited. A complete report contains the trigger code classification, pathway code, including safety barriers and causative factor taxonomies.

From the 2,644 RTE reports classified and coded locally, 1,609 were classified as levels 1-4, 312 of these were amended (complete fixed in figure 2). An 80.7% level of consistency was achieved for levels 1-4 RTE. This is a slight decrease from the previous reporting period\(^{(4)}\) when an 84.4% level of consistency was achieved. Some amendments were made to reports to ensure consistent allocation of classification and pathway codes for imaging associated RTE.

The DoL guidance document\(^{(3)}\) and good practice in RTE reporting\(^{(14)}\) give examples of the application of the classification, pathway and causative factor coding. For example, **TSRT9/ Level 4/ 13c/ 13i/ MD13hh/ CF1c/ CF2c** would be included in the first open text field of the local reporting and learning system.

A total of 654 RTE were classified or coded by PHE staff using the supporting text supplied by the local providers, (incomplete fixed in figure 2). This is a decrease since the last reporting period when 744 RTE were incomplete (13.8% decrease). Some 42 providers submitted incomplete reports.

However, 41.3% \((n = 270)\) of the incomplete fixed RTE were reported from just 1 provider. Some 33 providers submitted less than 10 incomplete reports. This was only 17.7% \((n = 116)\) of all incomplete fixed reports. If providers would like help with coding RTE please email the RT team at radiotherapy@phe.gov.uk.

Non-RTE reports submitted formed 0.7% \((n = 24)\) 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\(^{(4)}\). A PSI is defined by the NRLS as ‘any unintended or unexpected incident which could have or did lead to harm for 1 or more patients receiving care’\(^{(15)}\). Further information on PSI can be found in issue 5 of Safer Radiotherapy\(^{(13)}\). Non-RTE reports were excluded from the detailed analysis.
In total, 3,298 RTE for the reporting period from December 2019 to March 2020 were included for analysis. The analysis is presented here.

**Number of reports per provider**

There are now 60 NHS RT providers across the UK. For this reporting period, 88.3% (n = 53) of providers have submitted RTE reports using the TSRT9 trigger code, similar to the last reporting period (90.0%, n = 54)(4).

Figure 3 shows the number of RTE reports submitted by provider. This ranged from 1 to 336 reports, with a mode of 1 and mean of 62.2. Some 7 providers did not submit any reports for this reporting period. Of the 53 providers who reported, 63.2% (n = 34) reported less than the national mean. Figure 3 also indicates the classification of reports received per provider. Most providers submitting higher numbers of RTE reports include all classification of reports.

There may be several reasons for this disparity in reporting culture. Reporting culture varies within providers; reporting and learning systems are not always readily accessible; additional resource may be required to support a fully reporting and learning system, and a requirement to use more than 1 reporting system may disincentivise reporting.
The third in a series of surveys of UK RT providers in 2014\(^{(16)}\) on reporting culture demonstrated that those departments with fully electronic single reporting and learning solutions, which were accessible in all areas of the clinical department, were most likely to submit greater numbers of RTE.

The number of reports per provider has not been normalised to account for this variation in provider capacity or service specification. It should be noted that those centres reporting higher numbers of RTE represent providers with mature reporting cultures and should be encouraged to continue reporting.

**Figure 3. Number of RTE reported by provider (n = 3,298)**
Breakdown of process codes

Figure 4. Breakdown of RTE process code by level (n = 3,078/3,298 subset of RTE)

The 3,298 RTE reports were categorised by process code according to DoL\(^{(3)}\), so that the main themes could be derived. Figure 4 shows 44.1% (n = 1,453) of the RTE were reported to have occurred during treatment unit processes. The treatment process represents the last opportunity to identify errors. Accurate treatment relies on the correct interpretation of the treatment plan and set-up details which need to be replicated at each fraction of treatment. This might explain prevalence of RTE within 'treatment unit processes'.
The most frequently reported process subcodes in the RT pathway are presented in Figure 5. This subset of data was also broken down by level. The most frequently occurring RTE reported was 'on-set imaging: production process' at 13.3% (n = 440) of all the reports. This has decreased from 14.5% (n = 518) in the previous reporting period\(^{(4)}\).

Of this subset, 93.9% (n = 413) reports were level 3 events. The second most frequently occurring RTE was 'use of on-set imaging' at 5.4% (n = 178). On-set imaging associated RTE include; 'on-set imaging: production process', 'use of on-set imaging', 'on-set imaging: recording process' and 'on-set imaging: approval process'.

These combined on-set imaging associated RTE made up 25.3% (n = 835) of all RTE reported for this reporting period. Further guidance on mitigating and reporting these types of RTE can be seen in the PHE good practice guidance series\(^{(14)}\).
Classification (level) of RTE

Each of the 3,298 RTE reports was classified as ‘other non-conformance’, ‘near-miss’, ‘minor radiation incident’, ‘non-reportable radiation incident’ or ‘reportable radiation incident’ (Figure 6).

Of the RTE reports, 98.8% (n = 3,257) were minor radiation, near-miss or other non-conformities with little or no influence on patient outcome. Of the remaining 1.2% (n = 41) RTE reports, only 0.6% (n = 21) were reportable under IR(ME)R to the appropriate authority.

The national survey on reporting culture in issue 27 of Safer Radiotherapy\(^{(13)}\) indicates that providers are more likely to submit RTE reports of higher classification (levels 1 – 3) to the national voluntary reporting system.

It was found RTE reports of lower classification (level 4 – 5) are less likely to be shared due to resource constraints\(^{(13)}\).

**Figure 6. Classification (level) of RTE reports (n = 3,298)**
Reportable radiation incident (Level 1) RTE

Reportable radiation incidents, as defined in TSRT\(^{(2)}\), fall into the category of reportable under IR(ME)R\(^{(7-9)}\). 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 a single exposure. This meant that corrective action could be taken over the remaining treatment fractions, so the incident did not have a significant effect on the patient or the outcome of their treatment.

There were 21 reportable radiation incidents submitted to the voluntary system from December 2019 to March 2020 (Figure 6), comprising 0.6% of the RTE reviewed; this is a slight decrease from 38 (1.1%) reportable radiation incidents in the previous analysis\(^{(4)}\). Further analysis of the reports indicates the points in the pathway at which the reportable incidents occurred (Figure 7).

‘On-set imaging: approval process’, ‘verification of diagnosis/extent/stage’ and ‘localisation of intended volume’ each comprised of 13.6% (n = 3) of these reportable radiation incidents. An example of ‘on-set imaging: approval process’ reportable RTE includes the incorrect matching of a verification image, including the mismatch of vertebrae leading to a geographical miss.

An example of ‘verification of diagnosis/extent/stage’ includes the CT planning scan or treatment of a patient without the verification of an appropriate diagnosis (see case study 1). An example of ‘localisation of intended volume’ includes the geographical miss of a volume required on a planning scan, leading to the requirement of multiple rescans. Further guidance on verification of diagnosis/extent/stage can be seen in the inspectorate case study section of this document.

Figure 7. Breakdown of level 1 RTE by process subcode (n = 21)
Non-reportable radiation incident (Level 2) RTE

A non-reportable radiation incident is defined as a radiation incident which is not reportable, but of potential or actual clinical significance\(^{(2)}\).

Non-reportable radiation incidents comprised 0.6 % (n = 20) of the RTE reported from December 2019 to March 2020 (Figure 6). This is a slight increase since the previous analysis, when non-reportable radiation incidents comprised 0.4% (n = 16)\(^{(4)}\). Further analysis indicates the points in the pathway at which non-reportable radiation incidents occurred (Figure 8).

The reports were spread across just 10 different subcodes. ‘On-set imaging: approval process’ comprised 35.0% (n = 7) and was the most frequently occurring event within the non-reportable radiation incidents. An example of RTE associated with ‘on-set imaging: approval process’ includes the mismatch of reference and verification imaging which does not lead to a total geographical miss.

This was also the most frequently occurring non-reportable radiation incident in the previous analysis (25.0%, n = 4)\(^{(4)}\). Further guidance on reducing this type of event can be seen in issue 3 of Safer Radiotherapy\(^{(13)}\).

Figure 8. Breakdown of level 2 RTE by process subcode (n = 20)
Minor radiation incident (Level 3) RTE

A minor radiation incident is defined as a radiation incident in the technical sense, but of no potential or actual clinical significance\(^2\).

Minor radiation incidents comprised 36.7% (n = 1,209) of the RTE reported from December 2019 to March 2020 (Figure 6). This is an decrease from 1,400 (39.3%) in the previous analysis\(^4\). A breakdown of level 3 RTE by process subcode can be seen in figure 9. ‘On-set imaging: production process’ was the most frequently occurring event (34.2%, n = 413) within this subset. This is similar to the previous four-monthly analysis\(^4\) (35.1%, n =491). Examples of this type of minor radiation incident included setting the incorrect jaw position for kV imaging.

A large proportion of the level 3 reports were related to on-set imaging, (51.2%, n = 619), similar to the previous analysis\(^4\) at 51.3% (n = 718). Further guidance on these types of RTE is available\(^14\). A total of 51.3% (n=212) level 3 RTE with the primary process subcode ‘on-set imaging: production process’ were attributed to equipment malfunction.

Examples of this type of RTE include CBCT faults during acquisition. Equipment malfunction and on-set imaging: production process is discussed further in issue 18 of Safer Radiotherapy\(^{13}\).

**Figure 9. Breakdown of most frequently reported level 3 RTE by process subcode (n = 931/1,209 subset of RTE)**
Near-miss (Level 4) RTE

A near-miss is defined as a potential radiation incident that was detected and prevented before treatment delivery\(^{(2)}\). Near-misses comprised 24.8% (n = 817) of the RTE reported (Figure 6). This is similar to the previous analysis\(^{(4)}\) (23.1%, n = 822). Figure 10 shows the most frequently occurring process subcodes for level 4 RTE.

**Figure 10. Breakdown of the most frequently reported level 4 RTE by process subcode (n = 406/817 subset of RTE)**

- (11i) Target and organ at risk delineation
- (6a) Bookings made according to protocol
- (13aa) On-set imaging: approval process
- (2d) Critical examination under IRR99
- (11n) Recording of patient specific instructions
- (13bb) On-set imaging: recording process
- (11j) Generation of plan for approval
- (12j) Accuracy of data entry
- (10j) Documentation of instructions/information
- (13i) Use of on-set imaging

'Use of on-set imaging' comprised 9.1% (n = 74), followed by ‘documentation of instructions/ information’ at 7.6% (n = 62). An example of RTE associated with ‘use of on-set imaging’ is the omission of verification imaging on fractions required in the imaging protocol. An example of RTE associated within ‘documentation of instructions’ is the incorrect entry of information regarding the set-up, positioning and immobilisation of a patient at pretreatment.

This error is then not recognised until patient set up at treatment. Further details on ‘documentation of instructions’ can be found in issue 8 of Safer Radiotherapy\(^{(13)}\) and issue 7 contains further details on the ‘use of on-set imaging’. All but one of the most frequently reported near-miss RTE also featured in the most frequently reported near-miss RTE within the previous analysis\(^{(4)}\). The most frequently occurring level 4 RTE graph shown in figure 10, includes a pathway subcode ‘critical examination under IRR99’ (now IRR17); this subcode was reported by a single provider and was first featured in the most frequently occurring near miss RTE in previous analysis.
Other non-conformance (Level 5) RTE

Other non-conformance is defined as a non-compliance with some other aspect of a documented procedure, but not directly affecting radiotherapy delivery\(^2\).

Level 5 RTE comprised 37.3% (n = 1,231) of all RTE reported for this period (Figure 6). This is similar to the previous analysis\(^4\) (36.1%, n = 1,288). The most frequently reported level 5 process subcode was 'bookings made according to protocol' (7.0%, n = 86), (Figure 11).

**Figure 11. Breakdown of the most frequently reported level 5 RTE by process subcode (n = 512/1,231 subset of RTE)**

Examples of level 5 RTE associated with bookings made according to protocol include booking patient appointments on the incorrect treatment machine or across the incorrect dates. This RTE is detected early and does not affect the patient’s outcome in any way. This was followed by ‘generation of plan for approval’ (6.3%, n = 77).

An example of another level 5 RTE associated with ‘generation of plan for approval’ is the incorrect generation of a plan, including the incorrect field placements or incorrect adherence to DVH tolerances; this is then detected before treatment.

The booking process includes 6 different process subcodes, which were reported in 17.6% (n = 217) of level 5 RTE. Eight of the most frequently reported level 5 RTE were also seen in the previous reporting period\(^4\).
Safety barriers

A safety barrier (SB) is a critical control point, detection method or defence in depth, or any process step whose primary function is to prevent errors occurring or propagating through the RT workflow\(^{(17)}\).

SB embedded in the pathway coding\(^{(3)}\) can be allocated to each RTE report to identify all points in the pathway where the error was not detected (failed SB). Multiple SB codes can be attributed to each individual RTE. A total of 2,077 failed SB were identified in the RTE reported.

SBs associated with treatment unit processes were attributed to 39.7% (n = 824) of all failed SB. The most frequently failed SB are represented in figure 12. Treatment process ‘use of on-set imaging’ was the most frequently reported failed SB (12.6%, n = 261) in this and in the previous analysis\(^{(4)}\). This was also the most frequently reported primary failed SB (16.9%, n = 178).

Figure 12. Breakdown of failed safety barriers by level (n = 1,344/2,077 subset of RTE data)
Effective SB or method of detection (MD) can be identified also utilising the safety barrier taxonomy. For the reporting period December 2019 to March 2020, 21 providers indicated MD in 28.3% (n = 936) reports.

This is an increase from the previous reporting period where 20 providers indicated MD in 20.4% (n = 734) reports. Issue 24 and 28 of Safer Radiotherapy\(^{(13)}\) include guidance on the application of MD coding. Following consistency checking, PHE coded a further 586 reports with SB taxonomy, resulting in 1,522 reports for analysis.

The most frequently reported MD can be seen in figure 13. For this reporting period, the most frequently reported MD was 'on-set imaging: approval process' (25.0%, n = 380), 82.9% (n = 315) of these were reportable, non-reportable and minor radiation incidents.

**Figure 13. Breakdown of MD (effective safety barriers) by level (n = 1,113/1,522 subset of RTE data)**
Causative factors

The use of a causative factor taxonomy enables identification of system problems or root causes that could precipitate a range of different incidents\(^{(18)}\).

The causative factor taxonomy has been applied to 2,721 (82.5%) RTE reports by 45 (84.9%) providers for this reporting period. This is similar to the last reporting period, when 47 (87.0%) of providers applied the coding to 2,886 (81.0%) RTE\(^{(4)}\).

Following consistency checking, PHE coded a further 577 reports, resulting in all RTE reports containing coding for this analysis.

The PSRT recommend including the causative factor taxonomy for all RTE, this will aid trend analysis to identify system-problems or root causes.

Figure 14. Breakdown of most frequently reported RC by level (n = 3,181/3,298 subset of data)

Figure 14 shows the most frequently reported primary causative factors which are the root cause (RC) of an incident. Similarly to the previous analysis, the most frequently reported RC was individual ‘slips and lapses’ (41.3 %, n = 1,362), followed by ‘communication’ (15.3%, n= 504).

‘Slips and lapses’ was most frequently attributed to ‘on-set imaging: production process’ (10.6%, n = 144), and ‘communication’ was most frequently attributed to ‘documentation of instruction’ (13.5%, n = 68).
Issue 22 of Safer Radiotherapy\(^{(13)}\) includes guidance on minimising the occurrence of RTE caused by a slip or lapse of an individual. Most RTE (98.9%, n = 1,347) associated with ‘slips and lapses’ were minor radiation, near miss or other non-conformities with little or no impact on patient outcome.

Several causative codes can be attributed to each individual RTE. A review of the second to fifth codes indicate the contributory factors associated with an incident.

Contributory factors (CF) were indicated across 933 reports; 152 of these contained multiple codes leading to 1,098 CF. Figure 15 shows the most frequently reported CF, with ‘adherence to procedures/protocols’ at 44.6%, (n = 490).

**Figure 15. Breakdown of most frequently reported CF (n = 1,026/1,098 subset of data)**

- (CF 5e) Inadequate training
- (CF 3c) Device / Product design
- (CF 2d) Process design
- (CF 2b) Inadequate procedures / protocols
- (CF 5d) Inadequate staffing
- (CF 1b) Decision making process
- (CF 1a) Failure to recognise hazard
- (CF 1d) Communication
- (CF 1c) Slips and lapses
- (CF 2c) Adherence to procedures / protocols
Brachytherapy RTE

Brachytherapy (BRT) is a RT sub-speciality which involves the placement of a sealed source inside or close to the treatment area\(^{(19)}\). BRT makes up less than 3% of all RT episodes\(^{(11)}\), therefore the number of BRT associated RTE would be expected to be low. RTE coded with BRT process subcodes as the primary code account for 0.5% \((n = 18)\) of reports, similar to the previous report\(^{(4)}\) (0.7%, \(n = 24\)).

Many of the BRT RTE reported were near misses or non-conformances \((88.9\%, \ n = 16\)\) and only 11.1% \((n = 2)\) were classified as minor radiation incidents. No BRT RTE were classified as reportable radiation incidents (Figure 16).

The most frequently reported BRT process subcode was ‘planning of treatment’, comprising 22.2% \((n = 4)\) of all BRT RTE. An example of this type of RTE included the delay in a plan being ready delaying patient treatment. Issue 20 of Safer Radiotherapy\(^{(13)}\) includes further guidance on BRT RTE.

Multiple pathway subcodes can be assigned to each RTE. A total of 22 subcodes were identified across the 18 BRT RTE reports. Only 7 subcodes were identified as failed SB. The most frequently failed SB was equally ‘management of variations/ unexpected events/ errors’ and ‘end of process checks’, each comprising 28.6% \((n = 2)\) of all BRT RTE. Only 6 method of detection (effective safety barrier) subcodes were assigned to the BRT RTE. The most frequently reported subcode was ‘end of process checks’ (33.3%, \(n = 2)\).

Figure 16. Breakdown of BRT RTE coded ‘15’ by level \((n = 18)\)
The causative factors were reviewed within this subset of the dataset. All 18 BRT RTE were attributed to 8 different RC as shown in figure 17. The most frequently reported RC associated with BRT RTE was ‘adherence to procedures/protocols’ and ‘equipment or IT network failure’ (each 22.2%, n = 4).

**Figure 17. Breakdown of BRT RTE root cause (n = 18)**
References


