Letter

Response to Editorial in the JRP by Robson, Clark and White 2014 patient safety: the journey towards safer radiotherapy

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Dear Professor Duxbury,

We read with great interest the editorial by Robson et al. on the subject of patient safety in radiotherapy. We commend the authors on tackling this potentially sensitive issue and agree with much of the sentiment, in particular we agree with the following:

- Patient safety should remain a priority.

- Transformational leadership is important both for ensuring an appropriate safety-orientated culture, good reporting of errors and maintaining adequate staffing levels.

- Skill mix and staffing should be appropriate to numbers treated.

- Workspaces should be designed to avoid interruptions to staff undertaking key tasks.

- The positive work of Public Health England in reporting errors so lessons can be learned.

- Majority of errors in recent reports are minor incidents indicating a maturing safety culture in the UK.

However, we feel the editorial omitted some important messages that are worth highlighting.

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PROCESS STANDARDISATION: RADIATION ONCOLOGY AS A HIGH RELIABLE AND VALUE CREATION ORGANISATION

The rate of events within radiation oncology is difficult to estimate, as there are marked inter-study and inter-database differences in the methods used to define an event. Based on the available data, a reasonable estimate is that there is an event during the course of treatment in ~1–3% of patients, but the vast majority of these are not clinically relevant. Importantly however, ≈1 in 1,000–10,000 treated patients is affected by a reportable event with potentially serious consequences. This compares unfavourably with high reliable industries such as commercial aviation (≈1 death in 4·7 million passenger flights[1]; or other areas of medicine such as anesthesiology[2] (≈1 death in 200,000 procedures). The relatively high rate of any type of event within radiation oncology is cause for concern as it suggests inherent shortcomings of our current systems. Further, there is reason to suspect that the risk of serious incident that reaches patient within radiation oncology might be *increasing*. Given the uncertainties in collected quantitative data related to the probability of incident, and their clinical severities, it is challenging to prove or disprove this suspicion. A successful outcome requires multiple persons with diverse responsibilities and capabilities to repeatedly perform in a

reliable and predictable manner. Robust and efficient systems, operating at all levels of an organisation, are needed to promote such behaviour. High reliability and value creation organisations know this to be true.

DECISION MAKING PROCESS: THE HUMAN BEHAVIOURAL FACTOR IN RADIATION ONCOLOGY

Without careful consideration, radiation therapy errors can be directly linked to decisions and behaviours of individual people. However, most errors are due largely to multiple latent failures and pathways, mostly upstream from the targeted individual. To better understand this phenomenon, we must better understand how and why people behave and make decisions under various conditions, and the impact of organisational and workplace factors on people's safety mindfulness. Workarounds are often done without addressing the underlying root causes, or without correcting the root causes of latent failures and their associated pathways. Another variation occurs when individuals deviate from standard procedures and processes by taking shortcuts to get work done 'faster'. Unfortunately, shortcuts can lead to errors. When defects are present, the management challenge is to transform *Quick Fixing* behaviour like workarounds into *Initiating* behaviours by empowering people to root-cause problem solving behaviours. Workers need to be encouraged to call attention to the defects and provide the organisation with the opportunity to take preventive action and potentially eliminate the latent and active failures and their respected pathways. In the absence of defects, the most desirable approach is to encourage individuals to continue to use the agreed-upon workflows while also continually looking for opportunities for improvement, termed *Enhancing* behaviours. Leadership should reinforce *Enhancing* behaviours via accolades to the staff, and celebration of compliance and participation in quality improvement. In contrast, *Conforming* behaviours (e.g., not looking for the opportunities to improve) and *Expediting* behaviours (e.g., taking shortcuts) should be challenged, discouraged and eliminated.

PROCESS INFRASTRUCTURE SUPPORT: LEARNING FROM OTHERS

An organisational infrastructure supportive of a high reliability and value creation is necessary to create a culture of safety; an example is the commercial aviation industry and their infrastructure. First, the commercial aviation industry acknowledges that human error will happen and thus emphasises training initiatives focused on mitigating secondary serious/catastrophic incidents that may result from errors. While they train employees to *prevent* errors, they also train employees on how to address and cope with (what they see as inevitable) errors. Most commercial airline carriers encourage, reward and pay staff to ensure that they receive the quality/safety training required. If an employee misses or fails training/proficiency checks, they usually face restrictions until their underperformance has been rectified. When employees adhere to safety guidelines, or go beyond what is required, appropriate rewards are granted. One popular training programme for pilots is called Crew Resource Management (CRM). CRM is a training programme focused on culture, teamwork, communication, the inevitability of errors, and ways to avoid, trap (i.e., contain), and mitigate the hazards (resulting from the error) before they lead to serious or catastrophic harm. In most developed countries, pilots must now demonstrate their competency in CRM as part of their annual reaccreditation.[3]

Commercial aviation implements policies and standard operating procedures that enforce safe operations. For example, there must always be two physiologically and psychologically sound pilots to fly a plane. Further, during the safety-critical phases of a flight, such as flying below an altitude of 10,000 feet, the pilots and cabin crew must adhere to strict standard operating procedures and refrain from all non-essential activities (e.g., reading newspapers or chatting idly). This safety requirement is known as the sterile cockpit rule. Adoption of comparable policies in radiation oncology centres would be controversial, but it might better ensure patient safety. Such highly specified policies and standard operating procedures can be easily audited for compliance. Work standard procedures are an integral part

of the broader organisational system, and its professional culture. We do not want our staff to do *routine jobs*. We expect them to be mindful of the work they do. The balance between standardising actions for safety, yet maintaining worker's mindfulness of their actions, can be challenging.

ERROR REPORTING

While error reporting on the whole in the UK is good (departments participating in the Public Health England reporting system has risen to 83%[4]) a national survey in the United States indicated concern by some staff of fear of reprisals.[5] Despite good compliance with national reporting here in the United Kingdom, in a recent national survey while the majority of staff felt able to report errors 18·6% felt departments blamed or punished those involved in incidents.[6] Hence there is still work to be done on encouraging a positive reporting culture where there is no fear of reprisal.

SET-UP ERRORS

The authors acknowledge the positive messages from the Health Protection Agency report[7] but it is important to note that of the reportable errors identified in the 2012 report over a third were treatment set up related, and specifically a result of incorrect movements from the tattoo or reference point to the isocentre. These types of errors were also the most frequently occurring non-reportable errors and minor incidents. Minor incidents also included a significant number of on-treatment imaging errors that included inaccurate analysis of field placement. This latter issue has implications for education and training and educators and trainers (both university and hospital based) should be aware of the importance of this data especially as image-guided radiotherapy has become standard practice. What the data is unable to tell us is the circumstances within which such errors occur, and this is important for preventing recurring errors of this nature; this is where we feel the editorial is most lacking.

WORK SPEED

We know that work speed influences therapy radiographers (radiation therapists) ability to apply treatments accurately[8] we also know that there is an association between workload and the potential of human effort.[9] New technology such as flattening filter free linear accelerators and the use of volumetric modulated arc therapy are allowing reductions in beam on times with the potential for increases in patient throughput. Increasing the workload and the speed with which staff are working may have deleterious effects on set-up errors and this needs to be monitored. In particular, it is important to acknowledge that it is not just patient numbers that are important as the authors indicated in their editorial. In radiotherapy patient numbers do not adequately reflect workload. Workload measures should include measures of radiotherapy technique complexity[10] or task load, based on mental and physical demands.[9]

BURNOUT

We also know that there is some link between reports of burnout and risk of making an error[11] although it is unclear whether making a mistake leads to burnout or whether suffering from burnout increases the likelihood of making an error. We do know that a proportion of the oncology workforce suffers from burnout[6,12–14] and work needs to concentrate on interventions to reduce the opportunity for burnout in an effort to reduce the potential for further radiation errors.

AUTOMATICITY

The potential for involuntary automaticity has also been highlighted as a cause of at least one radiation error.[15] Where departmental practice is to have site-specific linear accelerators that treat primarily a single type of set-up (e.g., prostate cancer only or breast cancer only cases) as a way of maximising efficiency is there potential for involuntary automaticity to occur in these circumstances? Another factor that may contribute to automaticity is the warning messages in record and verify systems that users are required to acknowledge or act on. Where there are a number of false warnings this may make the user more prone to acknowledge them without appropriate action in future. Similarly, the virtual touch guard on some linear accelerator designs are very sensitive, the software often asks the user to override 'patient

protection' even when there is ample clearance, again potentiating future automatic over rides where there may be potential for collision.

PROCESS IMPROVEMENT

On a positive note there have been process improvement measures that have been shown to enhance patient care and safety in radiotherapy such as those reported by Adams et al.[16] where a range of measures such as the introduction of rapid improvement events reduced interruptions of therapy staff by 80% and peer review resulted in a change of treatment plans in 55% of cases. There is much we can learn by collaborating beyond NHS boundaries to understand the circumstances where radiation errors are most likely to occur.

In summary, while we applaud the sentiments of the editorial we feel there is room for improvement and specifically a number of areas that require further research. In particular, leaders need to reinforce enhancing behaviours and mindfulness in staff. We should look to other professions where there are well-developed safety cultures to learn lessons that could be applied in radiotherapy. There is a need to continue to support a positive culture of error reporting that is combined with system monitoring to investigate better systems and processes especially as new technology is introduced into clinical practice. We need to assess where gaps in training or competence have led to set-up errors so that appropriate educational programmes can be developed to reduce the potential for future errors. We need to understand the link between staff burnout and radiation errors and identify interventions that will minimise burnout (increase staff resilience to workload pressures and the pressures of caring in a resource limited health care system). We also need to better understand the impact of team dynamics, workload and task demands on the potential for errors and the impact of technological advances to the contribution of automaticity and increased work speed that can lead to errors.

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