Developing the radiation protection safety culture in the UK healthcare sector

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www.irpa.net/) has recognised that there is potential to improve how radiation safety challenges are addressed through the development or enhancement of a strong radiation safety culture in all sectors. In the UK, the desire to enhance radiation safety culture has been accompanied by an acknowledgement of the need for appropriate programmes and tools to assist with this. The Society for Radiological Protection (SRP) and its UK partner societies (figure 1) have established a number of sector-specific culture working groups – one of which relates to the healthcare sector – and the current status and early outcomes of their work will be reported at the 14th International Congress of IRPA in Cape Town in May 2016.

Comparison with other sectors

When talking about radiation safety culture in the healthcare sector, it is useful to consider other uses of radiation, most notably in the nuclear sector. The aims of the nuclear sector – the ongoing production of power for the country, together with defence and legacy issues – are obviously different from those of the healthcare sector – the prevention of death and/or the improvement of life quality – and it must be recognised that these inevitably lead to different priorities and a different mindset in the workplace. Nonetheless, it is the perception of the authors that in some respects the healthcare sector potentially has a poorer level of radiation safety culture than that in the nuclear sector. This stems partly from the fact that in healthcare, members of staff are generally concerned more for the wellbeing of the patient than themselves. However, to ensure the latter, there is a need for better organisation-wide appreciation of each other’s roles and their subsequent aims and pressures, as working together is necessary to improve radiation safety culture.

It is acknowledged that radiation exposure in the healthcare sector falls into two clearly different categories: (a) patient exposure, and (b) occupational exposure. It is expected that improvements in radiation safety culture will have beneficial effects in reducing both staff and patient doses, though not necessarily to the same degree. As good patient care is the primary aim of healthcare professionals, it is not surprising that radiation protection, along with most other aspects of safety, has a significant focus on the patient. Guidance on the control of patient exposure is generally well developed and in many cases is proactively implemented. However, many different professionals can be involved in the patient pathway and radiation safety culture needs to encompass all those who could affect the exposure of the patient, so there is undoubtedly scope for improvement. There is similar scope to improve the culture associated with the protection of staff from radiation exposure, noting that the collective radiation hazard to UK workers in the healthcare sector is largely similar in magnitude to that from UK nuclear sector.

Challenges to radiation safety culture in healthcare

In the UK there are a significant number of medical procedures carried out each year that use ionising radiation and the frequency of such procedures appears to be increasing, with an estimated increase of 10 per cent between 1997 and 2006 and an associated increase in the average annual radiation dose to each member of the public by about 20% from 0.33mSv in 1997 to 0.4mSv in 2008. Most of this increase is due to the rise in the number of computed tomography (CT) examinations, which generally deliver a higher radiation dose than conventional x-ray examinations.

The profile of clinical imaging today is influenced by a
number of factors including:

- The availability of, and advances in, diagnostic imaging technology
- Time pressures to create as much information as possible in one examination
- The growing prevalence of obesity which reduces the effectiveness of non-ionising methods such as ultrasound
- The increasingly defensive nature of modern medicine which has the potential to increase the number of unnecessary diagnostic procedures.

There are many pressures on clinicians, both from management and patients, to reach quick diagnoses and achieve a high rate of patient throughput. This can lead to a professional asking for every clinical imaging technique available, even if it is not the most appropriate, to make sure that they get all available in the first round of investigations, even if some prove to be unnecessary. Also, in the litigious world in which we now operate some medical professionals, especially junior members of staff, may be wary of ‘missing something’ and consequently feel inclined to request the most rigorous set of diagnostic examinations. Similar pressures on the diagnostic imaging team to achieve high patient throughput, and meet ever increasing referral demands, has the potential to lead to less checking and challenging of inappropriate requests, as indicated by Care Quality Commission (CQC) inspection reports.

A further challenge within healthcare settings, to patient and staff protection, is the limited understanding in the UK of the requirements of the radiation legislation within the medical and the allied healthcare professions. This problem is highlighted in a recent survey of trainee radiologists, for which results are shown in Table 1 and the high percentage of ‘No’ responses to the questions give rise to concerns. Anecdotal evidence suggests that infection control far outstrips radiation protection in terms of the level of awareness and good safety culture among this staff group.

Some further factors that can influence (and even limit) the development of cultural performance are desirable and might include:

- The distribution of worker doses per annum within the organisation
- Number of radiation-related incidents or near-misses per annum, and reporting levels
- Number of persons proactively attending radiation safety training as a percentage of those intending or registered to attend
- Number of late and non-returned personal dosimeters
- Evidence of involvement of appropriate professionals, including medical physics experts, in procurement and optimisation of equipment.

It must be acknowledged that no single ‘measurable’ or ‘manageable’ factor may be sufficient to give a true picture of what is happening with respect to cultural changes within an organisation, and trends in such ‘measurables’ might provide a better assessment. In addition, some quantities will be affected by multiple confounders that are not related to culture status such as workload or the application of better resources.

As an example, in the healthcare sector radiation workers are issued with passive dosimeters. The percentage of these dosimeters that are returned late or not at all is quite high (Figure 2); typical rates are 30% late return and 10% non-return of personal dosimeters. The non-wearing of personal dosimetry devices is also known to be a significant problem. In contrast, on nuclear sites, where passive personal dosimeters are used, non-wearing, loss or non-return would generally be treated as a disciplinary matter, particularly for repeat offenders. Persistently high rates of late and lost dosimeters would not be tolerated. These differences reflect different cultures. Improvements in the healthcare sector require such issues to be on the management’s agenda, with senior staff leading by example and communicating their expectations to other staff. The authors believe regulators can have an impact in achieving this.

**Keys to improving radiation safety culture**

It is believed that there are a number of common issues or factors that can influence (and even limit) the development of a strong radiation safety culture.

**A. Management and leadership**

Decisions or actions that lead to negative radiation protection consequences are often made with the best intentions in order to achieve other objectives important to the organisation or person making the decision, without a clear vision of the total impact. In the healthcare sector, examples could include repeating x-ray procedures as previous diagnostic data is not readily available, or failure to provide prompt and/or adequate training for all relevant staff in the safety features of a new piece of diagnostic x-ray equipment due to other demands on manpower resources.

Trust between senior management and employees is critical to the process of establishing or improving radiation safety and this can be very fragile. Consistent dialogue, openness and the development of common achievable safety goals must be developed and maintained.

Management at all levels must believe in the process of cultural change and be prepared to lead. Mixed, inconsistent, messages and a half-hearted approach will very quickly undermine the efforts of the senior team. Front line management is particularly important in setting local priorities and standards; failure to engage this level of management fully will derail the process.

Direct involvement of employees themselves is essential. Looking out for colleagues practising unsafe behaviour (consciously or unconsciously) often requires constructive challenge and therefore a great deal of sensitivity, mutual trust and confidence. Professional radiographers do assist the radiation protection culture by practising in a safe and effective manner and, if properly empowered (as an RPS etc), by influencing how radiography is seen by other healthcare professionals in the multidisciplinary teams. The Society and College of Radiographers (SCoR) anticipates a need to enhance its role as the ‘challenger’ in the system for requesting and justifying exposures, and promoting awareness of the requirements of legislation, particularly among physicians.

Radiation protection procedures must be written so that they mean something to the user. Good radiation protection practice must be rewarded and bad practice not tolerated. Healthcare staff must be encouraged to report incidents (without fear of blame) so that lessons can be learned. Tools must be provided and techniques adopted for auditing culture, but at the same time the process must be proportionate and enabling rather than preventative. The risks must be put into perspective so that other hazards, such as spread of infection, and a common language used.

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- Monitoring radiation safety culture

Endeavours for the development and/or improvement of a radiation safety culture need to be monitored in order to demonstrate effectiveness. As such, ‘quantitative measures’ of cultural performance are desirable and might include:

- The distribution of worker doses per annum within the organisation
- Number of radiation-related incidents or near-misses per annum, and reporting levels
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B. Knowledge of radiation risks and impact

Knowledge and understanding of the real radiation risks when balanced against their benefits are critical. A significant improvement in awareness and technical knowledge would greatly assist the development of a strong radiation safety culture. However, the knowledge needs to be matched to the needs of the organisation and the role of each individual within it, whether a manager, referrer or practitioner. It is important to identify the key roles involved, the knowledge and skills required for each role, and how that knowledge can be effectively imparted.

C. The role of the radiation protection adviser

A key player in developing and embedding a strong workplace radiation safety culture is the radiation protection adviser (RPA). However, this is a role that is not well understood in many areas. Although intended to assist the employer to optimise radiological protection and to achieve compliance with the law, from the perspective of an employer who is under pressure to deliver difficult goals, it can appear that the role is about creating hurdles to getting the job done simply and effectively.

The RPA often acts as a facilitator within his or her organisation, working influentially at all levels from very senior management to the ‘shop floor’. The demands of this role require good communication skills, such as persuasive abilities, and the ability to speak ‘the language of senior management’, and many RPAs need help to develop these. Very few relevant training opportunities are normally available to support RPAs in this endeavour. Therefore, it is important that professional bodies consider how to help RPAs develop these ‘soft skills’ which are vital to success in driving a successful radiation protection culture.

D. The role of the radiation protection supervisor

In the UK, the radiation protection supervisor (RPS) should be a frontline supervisor who monitors and strives to maintain the radiological safety of teams working with radiation. The RPS has a crucial role in developing and maintaining a strong radiation protection culture. However, the workload of this individual or group is often high, with competing pressures on time and priorities, which can result in operational priorities taking precedence over control of radiation practices. It is important that support is given to the RPS by employers and professional bodies, and to be effective, the RPS must have the standing and authority to stop work, and the experience to know what to do in an accident or non-routine situation.

E. The role of the professional bodies

Professional bodies (such as the SRP, IPEM, BIR, RCR, BNMS and the SCoR in the UK) have a direct role to play in promoting the development of a strong radiation safety culture. They should take a lead in ensuring that practitioners are aware of the importance of cultural issues, and should help to equip them adequately for their role in promoting good culture. They are also ideally placed to provide the link to external bodies that have responsibilities for, or impact on, radiation safety. Specific examples include interactions with key health service groups, regulators and equipment manufacturers. Professional bodies should seek opportunities to develop these links, and some examples of their recent actions to improve radiation safety culture include:

- SCoR ‘pause and check’ posters made freely available to ensure correct patient set-up prior to a clinical imaging examination (www.sor.org/news/free-have-you-paused-and-checked-posters-and-card)
- RCR referral criteria made freely available electronically
- SRP initiative to improve communication between stakeholders in relation to radiation equipment, including manufacturers.

F. Regulators

The regulators are a critical stakeholder group and individual regulatory inspectors have a powerful opportunity to offer support for developing an effective radiation safety culture. Indeed, investment by regulators in supporting this process is likely to be very cost effective, eg in reducing the number of incidents or regulatory infractions that they need to devote effort to. The potential role of senior regulators interacting with the boards and senior management of hospitals can be critical in gaining support from the top. Discussions between the regulators and the professional bodies could serve to actively promote the right conditions and behaviour by all parties for culture development.

G. Learning from experience

The development of a true learning organisation is one major attribute of a good culture. Without it we are destined both to repeat the mistakes of the past and ignore the lessons of past successes. Effective operational experience feedback (OEF) is therefore critical, but can be difficult to achieve. In some environments this is particularly challenging, with local sensitivities over releasing information for wider sharing and learning, and even a perceived risk of prosecution or litigation. Efforts are necessary to encourage the widest and most effective sharing of all learning opportunities.

Ongoing work

The current working group is conducting a large scale survey of hospital staff to assist in assessing the current state of radiation safety culture in the healthcare sector. Analysis of the survey data along with collection of data from additional sources such as inspections, audits, personal monitoring, etc will form a baseline against which future improvements in radiation safety culture may be assessed. The group has also identified ten key ‘culture factors’ that could be used to incorporate suitable questions into general inspection regimes, to develop metrics for inclusion in standards, and to input into training at all levels. Each culture factor has a number of suggested performance indicators that might be used to assess it, and these are summarised in table 2.

Conclusions

It is recommended that radiation safety professionals working in all areas in the healthcare sector should develop an action plan to achieve cultural development and improvement. The professional bodies should strive to establish ‘culture improvement tools’ and offer whatever help and support they can.

- Such tools could include for example:
  - Training resources including lectures and interactive material targeted at particular cohorts of staff
  - Audit tools including software or template questionnaires
  - Methods and software tools for measuring improvements in radiation safety culture pre/post implementation of changes.
  - Guidance notes on implementing staff incentives for ownership of radiation safety
  - A proposal for culture ‘champions’ within an organisation.
  - A clear financial and operational case for the benefits to any establishment of improving radiation safety, and the hazards of getting it wrong
  - A list of contacts for further help.

Overall, it is vitally important that we maintain a dialogue between healthcare professionals to share ideas and experiences as we work together to develop the radiation protection safety culture of the future.
UK partner societies.

- Society for Radiological Protection (SRP)
- Association of University Radiation Protection Officers (AURPO)
- Institute of Physics and Engineering in Medicine (IPEM)
- Royal College of Radiologists (RCR)
- British Institute of Radiology (BIR)
- Society and College of Radiographers (SCoR)
- British Nuclear Medicine Society (BNMS)
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<th>Performance indicator</th>
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| **Engagement of management** | • Senior management understand their role and responsibility in relation to radiation safety  
• There exists a clear management structure for radiation safety with link to executive board (or equivalent)  
• The radiation safety policy contains clear descriptions of management responsibilities and how these are audited  
• Evidence of clear communication between staff on radiation safety issues |
| **Appropriate training** | • Appropriate radiation safety training/qualifications are included in relevant job descriptions  
• Induction training contains appropriate level of radiation safety training – including general awareness training for non-radiation workers  
• Radiation workers and individuals recognised under IRMER have documented update training at specified intervals  
• Evidence that training complies with best practice guidelines if/when available from professional bodies |
| **Regular audit of radiation safety procedures** | • Schedule of audits including internal compliance audits with local rules and Ionising Radiation (Medical Exposure) Regulations (IRMER) procedures  
• Recent audit results of local rule compliance/IRMER compliance  
• Independent schedule of radiation safety audits (eg IRR99/EPR10 etc) |
| **Appropriate use of diagnostic imaging using ionising radiation** | • Documented use of appropriate referral guidelines  
• Evidence of culture whereby radiologists and radiographers can challenge inappropriate requests  
• Availability of non-ionising imaging modalities |
| **Appropriate management of radiation generating equipment and radioactive materials** | • Documented management system in place  
• Evidence of equipment replacement programme  
• Evidence of service/maintenance contracts  
• Evidence of QA (both equipment and standard operating procedures)  
• Evidence of action on QA results  
• Evidence of audit of radioactive materials policy and procedures  
• Disposal records  
• Compliance with permits |
| **Appropriate appointment and use of accredited experts and officers** | • Policy level statement of their appointment and proper consultation with them  
• Evidence of appointment of suitable numbers of qualified RPA/radioactive waste adviser/medical physics expert  
• Evidence of action following reports from experts  
• Evidence of appointment of radiation protection committee  
• Appointment of suitable number of RPSs |
| **Optimisation of patient dose** | • Formation of multidisciplinary ‘dose champion’ teams  
• Local diagnostic reference levels (DRL) in place  
• Results of audit against DRLs  
• Documented result of optimisation activity |
| **Management of staff doses** | • There exists a defined management system for personal dosimetry  
• Number of incomplete dose records (ie lost/damaged dosimetry) is recorded and acted upon  
• Evidence of routine checking of doses against investigation levels  
• Typical and maximum doses for different staff roles  
• Results of audit of use, checking and storage of PPE  
• Audit of compliance with local rules |
| **Appropriate incident handling** | • Documented procedures for handling radiation incidents  
• Evidence of timely reporting and investigation of incidents  
• Evidence of involvement of appropriate managers  
• Actions plans for lessons learned and implementation of any new procedures  
• Evidence of culture of ‘openness’ in reporting |
| **Effective communication** | • RP issues are on agenda of staff meetings  
• Staff have access to managers to raise concerns  
• Staff have access to union safety officers to raise concerns  
• Staff have access to ‘mentors/guardians’ to raise concerns  
• Management and advisers regularly communicate RP performance to relevant staff |

**Table 2**

Culture factors and performance indicators for the healthcare sector.