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**A QUALITATIVE ASSESSMENT OF RADIOTHERAPY TRAINING AT
A UK REGIONAL CANCER CENTRE.**

ABSTRACT

Background

Specialty trainees in Clinical Oncology must be competent in the coordination of both radiotherapy and systemic therapy at the completion of their training. Radiotherapy technology and postgraduate medical education have evolved significantly over the last two decades, but little is known of the educational impact of those changes within the dual training of the Clinical Oncology programme. A qualitative assessment of the radiotherapy component of training was undertaken at a single regional cancer centre in order to identify potential areas for improvement.

Materials & Methods

Consultants and trainees (n=10) at a regional cancer centre underwent semi-structured interviews regarding their lived experience of learning radiotherapy skills and knowledge. As Consultants and trainees can be considered equal co-investors in the process of radiotherapy learning, the same question stems were used for both groups. Interpretative phenomenological analysis was undertaken by the investigators to elicit the perception of both groups.

Results

Consultant and trainees' assessments of current radiotherapy learning standards differ for several aspects of training, as do their expectations of the other in learning processes. A lack of time is a major barrier in modern practice, and both groups can propose novel measures to improve learning locally.

Conclusions

Arrangements for learning radiotherapy have not kept pace with the rate of change in the Clinical Oncology discipline. Trainees and consultants have contrasting views on the state of training, its strengths and weaknesses, and pathways to improvement, which should be reconciled by programme coordinators charged with upgrading the training system.

KEY WORDS

Clinical oncology;

Radiation oncology;

Radiotherapy;

Training;

Learning;

Apprenticeship;

INTRODUCTION

Clinical Oncologists deliver both radiotherapy (RT) and systemic anticancer treatment (SACT) and UK trainees train for five years prior to independent practice (1,2). Historically, the apprenticeship model was the template for learning in this craft specialty (3). Clinical RT has transformed over the last two decades due to technological advances in computing and engineering (4). In preparation for practice as a consultant, trainees must be familiar with the scientific principles of RT, modern treatment paradigms, and conventional techniques (2).

Whilst supervised hospital-based practice enables trainees to generate relevant competencies, skills and knowledge, clinicians are responsible for their own learning (5). Bilateral engagement between trainees and their consultants is critical for the fulfilment of educational agreements however (6). There is limited published evidence on the effects of technological improvements and evolution of training conditions on CO training (7). This study assesses the RT component of CO clinical training in order to establish how the programme can improve the learning experience of trainees regarding RT.

METHODS & MATERIALS

Study Population

All thirty-four CO consultants and trainees at the regional centre were invited to participate in the study by email (8). The first five respondents to this email from each group were enrolled in the study. A modest sample of participants were interviewed, given the depth of qualitative analysis planned, as recommended (9).

Data Collection

Study participation was limited to undertaking a one-to-one semi-structured interview (GW) in a clinic room of the subject's choice at a time and place suitable to them after working hours. The semi-structured interview format employed allowed researchers to cover planned questions (see Figure 1) but also discuss unanticipated threads of discourse depending on the interviewee's responses (10). The main advantage of interviews over alternative educational research tools is the depth of detail

generated through participants expanding on elements of their lived experience, inclusive of both positive and negative opinions on modern radiotherapy learning (RL) as previously outlined (8). Audio recordings were transcribed (GW) once all interviews were completed. Study participants were given the opportunity to validate their interview content, known as member checking, to ensure their comfort with testimony.

Figure 1. Stem interview questions

Analysis

Interpretative phenomenological analysis (IPA) was undertaken independently (GW, JM) with subsequent group discussion in order to elicit the experiences of consultants and trainees, with 'bracketing' of the interviewer's own experience (11). IPA is an established approach for standardised and systematic method of intensive assessment of small numbers of personal accounts (12). Facilitated by the researcher's prior familiarity, IPA allows the researcher to become absorbed in the subject's perspective in the context of the wider scenario (9). Bracketing is the placement of one's own judgements and perceptions aside to approach the presented data objectively. A reflexivity diary was kept (GW) to document how the researchers distanced their own views from the subthemes emerging from the dataset. The importance of perspective in qualitative methodologies has been highlighted previously (13). The philosophy adopted by the researchers, the epistemological stance, was subjectivism. This approach to participants' accounts means findings are linked with the scenario directly at hand, rather than wider universal theories, meaning the practicality and accessibility of the results are enriched (14). Findings were reported according to the principles laid out in the 'Consolidated Criteria for Reporting Qualitative Research' recommendations (15).

Ethics and Governance

Formal ethical (No 17.64) and governance approvals [IRAS Project ID: 242 591] were successfully sought.

Research Team

GW is a senior trainee who undertook this work during MSc Clinical Education. JM is a Consultant in Clinical Oncology and Senior Lecturer in Medical Education with multiple local and national roles. GH is a Consultant and Senior Lecturer in Clinical Oncology.

RESULTS

Participant Characteristics

Ten consultants and trainees consented to participate (see Table 1). All participants originated from Northern Ireland. Mean interview duration was 23 minutes (range 13 - 32 minutes).

Table 1: Role, Gender and First Year of Training of Participants

Themes

Five distinct themes emerged from the perspectives offered. Subthemes were titled based on their content, but clustered themes were derived based on lengthy discussion by all three researchers, with re-reading of original content to resolve disagreement. The themes and subthemes within them are described in turn below with quotations organised to form Table 2.

Table 2: Themes of Perspectives Offered During Interviews with Exemplar Quotations

Theme 1: Ongoing Evolution

This theme is comprised of reflections on the changes within RT services, technology and training over the last two decades, with commentary offered by trainers predominantly. Whilst there is perhaps less time for training in radiotherapy skills specifically in the modern era, the quality of that training is generally better.

Radiotherapy focus

Consultants perceived that current trainee duties have become disproportionately concentrated on systemic therapy clinics and ward rounds, compared to 10-20 years ago.

Shape of service

Consultants recall that trainees spent a larger proportion of their time with their assigned consultant historically, and recalled a greater sense of belonging to a team. Learning was less structured with consultants routinely treating multiple tumour sites. Caseloads were smaller but trainees at the time perceived that interruptions to their planned work were less. Current trainees report benefit in recent years from the expansion of the clinical team to include specialist nurses and radiographers, off-setting some interruptions. There was no trainee-led referral phone service for other medical specialties in previous decades, which is currently considered highly disruptive.

Available technology

Historically, gaining experience in planning took place predominantly in the clinic using techniques unrecognisable to current trainees. Consultants perceived their exposure as trainees to advanced RT was less than in other regions when they were training, whereas all contemporary RT techniques are available to current trainees. Multiple training advantages of currently training at the local tertiary centre were reported including volume of patients, follow-up capability and case mix. Palliative RT is readily available, as is interdisciplinary teaching on advanced systems such as cone-beam CT. Modern treatment planning software was found to be user-friendly, which was important for trainee experience.

Consultant behaviours

Consultant study participants were heavily involved in most aspects of clinical care as trainees, with the trainee role focussed on a shadowing capacity and less stimulating RT activities such as on-treatment reviews.

Attitudes to training

In the past, accrual of the skills occurred in the workplace during everyday activities and feedback was usually informal, unstructured and retrospective. Progression through training was based on an apprenticeship model, rather than formal assessments. Whilst new treatment paradigms have been

implemented, a reliance on passive learning persists, although some consultants perceive sizeable responsibility for postgraduate education.

Theme 2: Variation in Standards

Accounts of inconsistency during training due to clinical, logistical and personality factors emerged as a significant theme, with commentary offered by trainees predominantly. Subthemes alluded to a lack of standardisation of training conditions during their training within the centre.

Consultant style

Trainers and trainees agreed a problematic lack of consultant availability for teaching as job plans included insufficient time for RT planning. Practical components such as brachytherapy were identified as being taught with excellence. Many participants acknowledged the dependency of RL on the type of RT employed and the willingness of the linked consultants to train.

Firm style

Alignment of trainee and consultant clinical activities fosters better opportunities for RL. Whilst some consultant schedules currently have a planning session incorporated into their week, it is regularly sacrificed for other duties, a pattern mirrored by trainees. Consultants compensate on an ad hoc basis, often out-with scheduled working hours.

Staffing levels

Consultants have witnessed a worrying trend of sacrificing RL in order to support service delivery during staff leave or sickness. Current trainees are minded to resist these trends but ultimately prioritise their duty to their patients. Support from clinicians with non-training positions is rarely available.

Modality complexity

Current trainees reflect on their RL during a rotation in the context of the treatment modality used in that disease site. Field-based planning is learnt with less difficulty, while the more complex treatments are considered to be more challenging.

Stage of training

Many interviewees recalled minimal RL during the initial years, with a subsequent acceleration ahead of Fellowship of the Royal College of Radiologists (FRCR) examinations. Several consultants credit the post-examination period for a considerable proportion of their training, and post-training fellowships come highly recommended.

Theme 3: Contribution of Consultants

Both staff groups expressed views generously on the elements of training where 'state of play' is arguably controlled by trainers. Subthemes emerged relating to how specific technical radiotherapy skills are gained, or how a dynamic permissive for learning can be established within a firm.

Volume delineation

Consultant feedback on volume delineation is perceived to be a significant aspect of modern RL by current trainees. Both participant groups prefer to have post-hoc review of trainee volumes. There is also enthusiasm for the model of side-by-side, direct demonstration. Advantages reported include real-time feedback, learning general principles, obtaining support for difficult cases and facilitating two-way learning. Consultant perspectives elicited which contradict trainees include the regarding of joint contouring as a suboptimal use of time, and that trainees dislike feedback.

Plan evaluation

Whilst a quintessential skill, the danger of concentrating on delineation only was noted. Participants strongly expressed positive views in relation to supervised trainee exposure to plan evaluation. Specific obstacles were discussed by interviewees, namely challenges of gaining exposure, and challenges of assessing competency. Progress has been made in recent years with increased consultant awareness and use of ePortfolio.

Radiological anatomy

Current trainees do not receive formal radiology teaching, although this is reportedly a national problem. Multidisciplinary meetings were noted to be an easily accessible source of anatomical teaching. Anatomy courses are infrequently undertaken in preparation for examinations.

Integration

Trainers recall and trainees volunteer a prohibitive lack of confidence amongst trainees and low levels of self-esteem relative to other staff groups in the RT department. Poor confidence levels are attributed to a combination of poor understanding of systems and processes, low levels of authority and the highly specialised technological activities being undertaken. The described lack of self-assurance detracts from a trainee's RL due to consequent reduced interest, engagement and help-seeking, which in turn may further impede growth of their RT acumen and assertiveness.

ePortfolio

Consultants have accepted the ePortfolio system for training documentation generally, with consensual recognition of its educational scope. The range of opportunities afforded by workplace-based assessments is considerable, including provision of a template for constructive feedback. Trainees are also enabled by the ePortfolio in settings where feedback is less forthcoming. Multiple consultants and trainees highlighted that engagement can be undertaken exclusively leading up to deadlines, possibly by consultants with whom trainees have particularly good working relationships, or retrospectively, introducing recall bias. Both groups complained about poor functionality of the online system. Interviewees had several ideas for potential strategies to improve workplace-based assessment such as utilising pre-clinic chart rounds to discern specific ePortfolio opportunities, 'on the spot' assessments without warning, and subdividing the RT assessment into consent, contouring, plan evaluation etc.

Protected learning

The absence of a sense of control in the trainee's working environment was noted by consultants and trainees. Despite being quite senior in their training, trainees appear to have little control over how they spend their time, resulting in missed learning opportunities.

Pro-learning behaviours

The motivation for the trainee to enhance their RT skills can be encouraged by the consultant, e.g. by agreeing ePortfolio aims at the beginning of each new rotation. Trainees derive benefit from spending time with the consultant but view shadowing as something that the consultant must initiate, a view not

shared by consultants. Consultants are conscientious of their responsibility to involve the trainee in daily matters. Current trainees suggest that consultants could communicate with trainees enabling them to be present for tasks of interest. There is variability in how prepared consultants feel to educate their trainees, yet competency as a trainer is an expectation of trainees.

Theme 4: Contribution of Trainees

Perspectives on those elements of training where trainees have arguably more control were collated in this theme, and accounts were offered by both trainers and trainees. A diverse range of human and logistical factors were explored in relation to how a trainee can best learn.

Proactivity

Trainee motivation is a multi-layered and key constituent of the RL process but the consultant-trainee relationship can also be influenced by the proactivity of the trainee. Interviewees stated unanimously that trainees can exert control over their training experience by displaying initiative. Whilst enthusiasm varies between individual trainees, ambition could be increased at the cohort level according to some consultants only.

Logbooks

A comprehensive record of involvement in RT cases is not mandated by RCR. Reflecting on a novel example template, it was suggested that RT activity could support feedback, reflection and allow temporal self-assessment. Trainees regard the ePortfolio's dual assessment and educational tool functions as being incompatible.

Learning resources

A range of materials exist in digital format that may assist a trainee's learning, such as locally-developed, primary tumour-specific RT clinical protocols, online radiological atlases and contouring courses. Barriers to using online courses and books for RT practice include expense, inapplicability, poor awareness and time constraints.

Near-peer teaching

A weekly session lasting one hour delivered by trainees on different topics of RT planning occurred historically, however in recent years has occurred infrequently. The high standard of content expected from peers drove learning for the presenting trainee.

Pro-learning behaviours

The attention given to RL and the value placed on potential learning events should be increased according to trainers and trainees. Ownership of cases for RT planning would allow the trainee to lead the learning partnership. Consultants reported that pressure to meet clinical deadlines impacts on training. Other tactics recommended for augmenting RL include perseverance for attending multidisciplinary meetings, reviewing images as well as scan reports, involvement in image-guidance, following up cases, and taking academic opportunities. Consultants and trainees consider RT planning outside of working hours to be a viable option for some trainees only. Current trainees may benefit from resisting distractions from RL opportunities.

Theme 5: Stakeholder solutions

The final theme identified construed how trainers and trainees had an abundance of modifications that could be implemented to potentially improve the quality of RL, some of which circumnavigate issues raised and are exemplified below.

ST3 induction

Immersion in new treatments, staff grade, hospital buildings, clinical pathways, medical procedures and software simultaneously is overwhelming for new trainees. The first year of training is viewed as an acclimatisation period by consultants and trainees. Local inductions are limited owing to staffing pressures and several interviewees were unsure of the induction's content or format. It was felt that poor induction has a bearing on RT engagement for trainees in particular. A lack of understanding of the RT process restricts new trainees' participation, and simultaneously they are focussed on theoretical learning for First FRCR – a view recalled by Consultants that was repeated by current trainees. Foreseeable logistical issues aggravate these difficulties, such as computer access. As a result, junior trainee uptake of preliminary RT-related knowledge and skills is suboptimal. Sacrificing their clinical contribution to engender a thorough departmental welcome was felt to be merited by both groups.

Primary site induction

Documented supervisor meetings are mandatory for each rotation, but trainers and trainees remarked that the format could be modified to increase their usefulness. Trainer and trainee views were concordant relating to a tumour site induction involving shadowing. Minimum contents of the induction may include the relevant RT protocol, evidence base, exemplar plans and a strategy for addressing their personal development plan. In contrast, some consultants took the view that little should be expected from junior trainees.

Peer review

RT Peer Review is highly regarded amongst trainees. Benefits for training include access to the technical RT experience of consultants, radiological anatomy, image-guidance troubleshooting, plan analysis experience, case presentation opportunities and direct learning through personalised feedback. Whilst Peer Review generates additional tasks for the trainee, it was remarked that participation can lead to increased confidence, and trainees would welcome its expansion across disease sites.

Interdisciplinary learning

Trainees obtain a rounded experience when they interact directly with non-medical members of the RT team and it is thought their expertise is under-used. Physics were praised as a learning resource by several interviewees, and special mention was made of the safe learning environment provided. Clinical technologists were also noted to be valuable teachers. A historically available immersive week with them is now accessed infrequently. Sessions with therapeutic radiographers are widely viewed as crucial for a comprehensive trainee understanding of the RT pathway.

Institutional attitudes

Both groups believe that changes in RL patterns can only occur if directed by the more senior management team. There is a view that the major changes in RT techniques may justify a shifting of the focus of specialty training. It was also noted that consultants interpret their role in modern RL in a myriad of ways, and it may be that extra resource is required to improve the advance training quality.

The 'wish list' of the interviewees included increased follow-through of RT cases and decreased commitment to peripheral clinics. Concerns regarding the impact of such changes on patients were explicitly stated, although several consultants reaffirmed the need for high quality training for the benefit of future patients.

Resources

Inadequate space, computer hardware and out-of-date IT infrastructure are regarded by interviewees as everyday barriers to RL.

Collegiality

Consultants remarked how there was a more heightened sense of belonging and connectivity amongst trainees and colleagues in the past, and more collaborative working.

Authority

The legal limitations on trainees' responsibility based on local rules, and often linked to FRCR examination accomplishments, diminish the integration of trainees into the RT team according to trainees. Gradually increasing the level of responsibility of the trainee offers potential advantages for learning and service. Transformative tactics could include devolving more complex RT tasks to trainees by the consultant, including them in relevant communiques with other RT staff and offering trainees the chance to develop image-guidance skills. It was thought that other RT staff stand to benefit from increased delegation of tasks to the trainee.

Novel measures

A scheduled regular discussion with clinical supervisors was frequently stated by participants as a requirement for improved RL. Trainees and consultants are open-minded regarding fresh approaches to group teaching sessions.

DISCUSSION

The absence of trainee involvement in the design and delivery of postgraduate medical training has been challenged (16–18). An interventional study found that RT trainees would alter specific areas of their teaching programme if possible (19). A methodology for assessing the quality of an RO program has not been agreed however (20). Trainee surveys have helped provide training programme coordinators with feedback in many countries (21–26) but there is a paucity of research on educational behaviours in the RL environment (27). This study sought a detailed understanding of the multi-layered national survey responses of medical trainees in RT, such as those organised by the Oncology Registrar's Forum (ORF), and has found that RL arrangements have not kept pace with the rate of change in the CO discipline. Subthemes identified in the current study complement issues raised in recent ORF national surveys, and provide additional depth. For example, 61% trainees were reported to feel confident in planning radical radiotherapy in the most recent ORF survey (25). Perhaps explaining this finding, the current study shows that trainees struggle to gain experience in volume delineation and plan evaluation due to asynchrony of their schedules with their supervisor, limited physical capacity in the treatment planning suite and a lack of basic knowledge in the more junior years.

There is the suggestion that radiotherapy has become more complex and centres have become busier, with an associated diminution of the apprenticeship model in CO. There may be more onus on the trainee to navigate advanced techniques, within a rigorously structured training programme, whilst adapting to the pressure of service provision in the modern era. The standardised, mandatory training requirements generally do not take account of local factors and some problems were reported with the interface with the curriculum, ePortfolio. The feedback on which competency-based training relies could be optimised, and increased consultant and trainee commitment to the learning of RT were suggested. Insufficient confidence restricts new trainees. There was a wide range of views on how best contouring should be learnt between trainees and consultants, some of which conflicted. Discordance between trainers and trainees has been identified in a mixed methods study in Australia and New Zealand where RO is practiced in isolation (28).

Mechanisms were proposed by interviewees to counter the challenges identified, including enhanced induction, interdisciplinary teaching, trainee empowerment and a focus on collegiality. Both groups offered tailored novel measures (summarised in Figure 2), illustrating the co-operative responsibility

perceived in relation to RL, many of which would go some length to engendering a contemporary apprenticeship model for CO training.

Figure 2. Suggested procedures for maintaining and improving the training programme.

This is the first UK study involving both trainers and trainees in relation to medical education and has several strengths and weaknesses. The techniques for data collection and analysis were informed by expert opinion in CO and medical education methodology (10). The study protocol (8) was reviewed internally by two local senior lecturers and the training programme director, and externally, by two national trainee representatives and an RCR fellow in medical education. The study design had narrow inclusion criteria, and the mix of junior and senior trainees and consultants recruited increased the cross-sectional representation of the population. Participants were offered the chance to edit their interview transcripts (one minor modification was made by one participant). It is anticipated the methodology would be directly transferrable to other centres, irrespective of the contemporaneity of their facilities. Providing a degree of validation, several proposals (for example additional radiology teaching) identified have been raised in other qualitative UK studies recently (29). Looking further back, it would seem from the results within that some historical issues remain incompletely addressed, such as adequate dedicated time for training for consultants (30,31).

Despite mindfulness for reflexivity and contribution of all authors to the analysis there is a small risk that the lead researcher's perspective as a trainee may have influenced analysis unduly. Furthermore, the semi-structured nature of interviews enables the interviewer to influence the direction of the dialogue. Selection bias was unavoidable as participants self-selected, and no participants' training pre-dated the year 2000. The identity of all participants in the study population was known to the authors which may have impacted sampling of the population. There is a risk of recall bias as data is reliant on participants' unverified memories. As the interviewees were known to each other it is possible that they conferred with prospective participants. Furthermore, it is not known if a larger sample size would have yielded additional insights (data saturation) as the sample size was pre-determined to account for available resources. Active involvement in the organisation of local training was considered as an exclusion criterion as this role was considered a conflict of interest, but information on previous involvement in

teaching organisation was not collected and this previous connection may have affected information offered by select participants. The study regrettably failed to recruit any senior consultants as no emails expressing interest in study participation were received during (or after) recruitment.

Finally, the generalisability of our findings is reduced by the study's small sample size and single centre format. Whilst these facets of the qualitative study design were suitable for the desired 'deep dive' analysis of RL at our centre, replication of the study in other centres may yield alternate results, specific to local circumstances, and such studies would be welcomed.

CONCLUSIONS

Differences exist between consultant and trainees' assessment of current RL standards, and each group's expectations of the other in some aspects of their RL role. The most significant barrier to RL is a lack of time in modern practice, both on the part of consultants and trainees. Overall, the gap between the rapidly developing field of RT and modern RL could be reduced by the modification of consultant and trainee learning habits, in the context of a revised institutional attitude towards RL.

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ABBREVIATIONS

RT = radiotherapy

SACT = systemic anticancer therapy

RL = radiotherapy learning

IPA = interpretative phenomenological analysis

FRCR = Fellowship of the Royal College of Radiologists

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