University of Malta
Faculty of Economics, Management and Accountancy

A Training Needs Analysis for Continuous Professional Development of Radiation Therapists in a small European Island State

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Dedication

I dedicate this project to my loving husband, Andrea.

I am beyond grateful for you.

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I would like to thank my husband and family for their unwavering support and understanding during this demanding period. Your love and encouragement have been my anchor, providing me with the strength to persevere.

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Abstract

Background & Scope: The field of Radiation Oncology is progressing globally with advances in technologies and new treatment techniques. This dynamic profession, therefore, requires Radiation Therapists (RTTs) to undergo frequent training in order to be able to keep up with this ever-changing quality of service. The scope of this study was to determine, through the perceptions of experienced RTTs, the training needs pertaining to continuous professional development in order to enhance workplace performance.

Outline: The study utilized a mixed method quantitative and qualitative research approach. This was carried out via a questionnaire incorporating closed and open-ended questions. The data collected through these approaches was then analysed through statistical data analysis and thematic analysis.

Results: From the findings, all RTTs seem to be in agreement on which tasks they perceive to be the most important for their training needs. Clinical tasks were considered as the most important tasks, followed by communication and teamwork, administrative and personal, and research and audit. Both training courses and the organization were perceived as important to achieve training and enhance workplace performance, with RTTs giving more value to the organisation, seemingly seeking for organizational improvements.

Conclusion: The training needs analysis performed in this study will enable the formation of an appropriate CPD programme for RTTs to ensure an ongoing safe and competent workforce at the Radiotherapy Department.

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List of Abbreviations

2D – Two-Dimensional

3D – Three-Dimensional

ALARA – As Low as Reasonably Achievable

CPD – Continuous Professional Development

CT – Computerized Tomography

DIBH – Deep Inspiration Breath Hold

EFRS – European Federation of Radiographer Societies

H-HTNA – Hennessy Hicks Training Needs Analysis

IGRT – Image Guided Radiotherapy

IV – Intravenous

LINAC – Linear Accelerator

MDT – Multidisciplinary Team

MR – Magnetic Resonance

RT – Radiotherapy

RTT – Radiation Therapists

SBRT – Stereotactic Body Radiotherapy

SCF – Supra Clavicular Fossa

SOP – Standard Operating Procedure

TNA – Training Needs Analysis

TR – Therapy Radiographer

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Chapter 1 - Introduction

Chapter 1 – Introduction

1.1 Introduction

For most countries in Europe, Radiotherapy (RT) is a profession that requires a university degree. It is crucial for all Radiation Therapists (RTTs) to understand that any type of entry-level training simply serves as the starting point of their career and that in order to guarantee a safe and skilled workforce, RTTs should participate in Continuous Professional Development (EFRS, 2013). The term "continuous professional development" (CPD) refers to a series of activities that individuals engage in to update and acquire new knowledge and skills that are pertinent to their profession and can be incorporated into clinical practice (Walsh & Craig, 2016). The significance of CPD and its role in enhancing the quality, safety, and care for patients and the general public is crucial at a time when patients are becoming more active and involved with the healthcare options accessible to them (Grehan et al., 2018). This justifies the necessity for a scientific foundation, specifically the use of the empirical approach to estimate the training needs of RTTs in relation to the CPD programmes necessary to meet international standards and enhance workplace performance.

1.2 Research Question

What are the training needs of Radiation Therapists regarding continuous professional development required to enhance workplace performance?

1.3 Aim

The field of Radiation Oncology is progressing globally with advances in technologies and new treatment techniques. This dynamic profession, therefore, requires RTTs to undergo frequent training in order to be able to keep up with this ever-changing quality of service. The scope of this study is to determine, through the perceptions of experienced RTTs, the training needs pertaining to continuous professional development programmes in order to enhance workplace performance.

1.4 Objectives of the Study

- To determine the current standard of continuous professional development currently being delivered to Radiation Therapists;
- To determine the present and future needs of the profession in regard to continuous professional development;
- To determine which areas of training are most beneficial to enhance workplace performance.

1.5 Background Information

Cancer is a significant public health issue across the world (Siegel, Miller, and Jemal, 2018). Every year in Malta, around 1,800 individuals receive their cancer diagnosis, and this number was expected to rise to 2100 by 2020 alone. This continuous rise in cancer incidences is related to lifestyle choices, including smoking and obesity as well as prolonged exposure to environmental carcinogens. As a result of the effectiveness of the

healthcare and social-care systems, the aging population has increase and consequently the lifetime chance of being diagnosed with cancer. Increased lifespan, combined with increased cancer survival rates, is contributing to an increase in the number of people living with or beyond a cancer diagnosis (The National Cancer Plan for the Maltese Islands, 2022).

1.5.1 Radiotherapy Definition

"Radiotherapy (RT), also known as radiation therapy, is a treatment modality based on the use of high energy rays or radioactive substances, to damage tumoral cells and to halt their growth and division" (Gianfaldoni et al., 2017).

Radiotherapy as a single agent or in combination with other treatment modalities has been an essential part of oncological treatment for over 100 years. It is a crucial therapeutic tool today for the management of various cancers. RT is expected to be administered as a stand-alone treatment or as a component of a more involved therapeutic regimen to an estimated two-thirds of cancer patients (Gianfaldoni et al., 2017).

Traditionally, radioactive elements that naturally occur and release photons during decay have been used to administer treatment. In the present day, this is generated by devices known as linear accelerators, which speed up an electron stream in the direction of a target and then produce photons as a result of atomic interactions inside that target. A mobile gantry directs these photons toward the patient, and as the radiation beam emerges from the gantry head, motorized collimators are employed to conform around the tumour (Maani & Maani, 2023).

1.5.2 History of Radiotherapy

Radiotherapy began to be explored only a year after the first discovery of x-rays in 1895, namely by Émil Herman Grubbé who used x-rays to treat a breast cancer patient in 1896. In the early 1900s, further studies were reported on the use of x-rays, particularly for dermatological cancers. Then in 1910, William David Coolidge invented an x-ray tube that would emit higher energy x-rays to penetrate deeper-lying tumours. This was followed by a number of other, very significant discoveries which would prove revolutionary in the treatment of cancer, summarized in Table 1.1. These include dividing the total dose of radiation for improved tumour control and side effects (fractionated radiotherapy) in 1920, the founding of the International Commission on Radiological Protection for the regularization of radiation protection in 1928, the introduction of the ionisation chamber in order to measure radiation doses in 1932, the orthovoltage era (1930-1950) which brought about interstitial treatment (brachytherapy) and electron treatments, the megavoltage era (1950) which introduced linear accelerators that allowed the treatment of deeper tumours with skin-sparing effects, ensuring fewer debilitating side-effects to patients. Eventually, proton therapy (1970) and adaptive radiotherapy through image guidance (IGRT) allowed for improved control and accuracy through the optimization of treatment respectively (Gianfaldoni et al., 2017). Moreover, technological advances in radiotherapy units and progress in imaging (from 2D to 3D) and computer-based treatment planning have transformed radiotherapy treatment into the highly accurate and effective treatment delivered today (Connell & Hellman, 2009).

Table 1.1. Radiotherapy Historical Timeline	
Discovery of X-rays	1895
First breast cancer treatment with X-rays	1896
X-rays used for Dermatological Cancers	1900
Invention of a new X-ray tube that would emit higher energy X-rays	1910
Radiotherapy Fractionation	1920
International Commission on Radiological Protection	1928
Invention of the Ionisation Chamber	1932
Orthovoltage Era	1930
Megavoltage Era	1950
Proton Therapy	1970
Transition from 2D to 3D conformal RT	1990
Modern Era: Stereotactic RT, Intensity Modulated RT, Volumetric Modulated RT, Tomotherapy, Cyberknife, MR LINAC, Ion Beam Therapy	2000-

1.6 Justification of Study

A Radiation Therapist or Therapeutic Radiographer (RTT/TR) is a healthcare provider who administers radiotherapy by operating linear accelerators to treat tumours whilst providing patient care (Oliveira et al., 2022). RTTs are key members of the multidisciplinary team that is also composed of doctors, physicists, and practice nurses who collaborate to design and conduct treatments as well as monitor patients' progress (How to Become a Radiation Therapist - Steps, Skills & Requirements, 2022). The profession’s clinical practice is continuously evolving in view of the rapid advances in technology and the complexity of treatment techniques. These ongoing rapid changes however lead to inquiries about whether RTTs are managing to modify their profession to accommodate such significant changes in service provision. Therefore, this warrants a formal training needs analysis (TNA) to identify aspects of CPD that may assist RTTs in adapting their practice to the ongoing developments of Radiotherapy treatment.

1.7. Continuous Professional Development

Clinical governance is defined as "ensuring high-quality patient care through best practices, accountability, ongoing multidisciplinary education, and a dedication to professional responsibility" (Gracía-Pérez and Gil-Lacruz, 2018). Continuous Professional Development (CPD) has become a priority in healthcare systems (Gracía-Pérez and Gil-Lacruz, 2018).

Continuous professional development is a concept that is well-established internationally (Mohamed Afif et al., 2021). The rationales behind CPD are maintenance, mobility, and survival. Maintenance pertains to the concept of life-long education, mobility aids for higher chances of employment, and survival ensures an increased level of competency (Lee et al., 2010). Moreover, CPD allows for the ongoing improvement of professional practice which consequently contributes to enhanced treatment outcomes and quality of care for patients (Grehan et al., 2018).

Education is a critical component of radiation safety because it underpins knowledge of the disease, technology, and their interconnections, as well as the implications of inappropriate exposure. The RTT must always be aware of the risk of injury that faulty or erroneous treatment preparation or delivery can cause. Additionally, rapid technological advancements in recent decades have resulted in the radiographer's role development and expansion (Coffey, Leech, and Poortmans, 2016) with the introduction of advanced practice roles (Oliveira et al., 2022). This means that it is essential for RTTs to continue their professional development and build expertise in order to keep up with the new technologies, techniques, and added responsibilities as practitioners.

1.7.1 Continuous Professional Development for Radiographers in Europe

According to the European Federation of Radiographer Societies (EFRS), in order to sustain and enhance relevant skills while ensuring the best care to patients, ameliorate health care procedures and establish a safety culture for patients, it is mandatory for radiographers to engage in CPD. Every Radiographer (both diagnostic and therapeutic) should document any CPD activity, through a portfolio or electronically with added capacity for reflection on the relevance of the activity to current practice. CPD activities should be reviewed annually by Radiographers and management to ensure the activities provided benefit both the Radiographer and Radiation Therapist as a profession as well as the exigencies of the department, service provision and all aspects of patient care.

A study concerning the review and mapping of CPD and lifelong learning for health professionals in Europe conducted in 2015, reported that across Europe, there is a wide range of approaches and frameworks in relation to CPD, with dissimilarities across different professions (CPME, 2015). The majority of the surveyed countries apply mandatory systems of CPD, some apply voluntary systems, while other countries incorporate both mandatory and voluntary aspects of CPD in different arrangements. Many countries use a credit system that may or may not affect their license. CPD programmes are delivered through formal and informal activities such as case presentations, clinical audits, discussions, hands-on courses, conferences, lectures, international events, regional events, self-assessment, peer-to-peer, research-based, seminars, symposia, and webinars (CPME, 2015).

1.7.2 Continuous Professional Development for Radiographers in Malta

In Malta, Radiographers and Radiation Therapists fall under the bracket of Allied Healthcare Professionals and are subject to both mandatory and voluntary CPD requirements. Mandatory CPD was established through a collective agreement between the Government of Malta and UĦM (Union Ħaddiem Magħqudin) pertaining to Allied Healthcare Professionals. Mandatory CPD is applied to Scale 7 Allied Healthcare Practitioners and entails a total of 30 hours of CPD annually, 10 of which must be presented against a certificate of achievement (UĦM, 2020). The Ministry for Health inspects conformity with the mandatory CPD. There are incentives in place to encourage professionals to engage in CPD. Fourteen days of paid study leave may be availed yearly for both mandatory and voluntary CPD, in addition to a scheme that reimburses costs on CPD activities up to €1165 yearly. Moreover, for mandatory CPD achievements, top-up allowances are allocated. CPD activities in Malta mostly involve conferences, lectures, seminars, international events, and webinars.

1.8 Implications of the Study

To date, there is very limited published research on the perceptions of RTTs on training needs in regard to continuous professional development and the impact on workplace performance. The majority of the published research is generally focused on diagnostic radiographers, nurses, and physicians; thus, this study will help to close this gap in research. Additionally, the training needs analysis performed in this study will enable the formation of an appropriate CPD programme for RTTs to ensure an ongoing safe and competent workforce at the Radiotherapy Department.

1.9 Outline of the Study

The study will utilize a mixed method quantitative and qualitative research approach. This will be carried out via a questionnaire incorporating closed and open-ended questions. The data collected through these approaches will then be analysed through statistical data analysis and thematic analysis.

1.10 Framework of the Study

This study will be presented in six chapters:

- Chapter 1 – Introduces the rationale behind the research and includes the aims and objectives.
- Chapter 2 – Establishes a critical evaluation of the literature relevant to this research.
- Chapter 3 – Demonstrates the applied methodology process in detail.
- Chapter 4 – Exhibits the results from the collected data.
- Chapter 5 – Presents discussion of collected data based on existing literature.
- Chapter 6 – Determines the conclusions of the study and any appropriate recommendations.

Chapter 2 – Literature Review

Chapter 2 – Literature Review

2.1 Introduction

The literature review aims to collect current, pertinent research on the subject in question and combine it into a coherent summary of existing research, which is then critically appraised to comprehensively understand the research problem. Moreover, it is the process of identifying, evaluating, and integrating information. The literature review also aids to discover any gaps that may be present in a particular subject. This ultimately allows to build a robust foundation and broaden the knowledge on the subject addressed in the research question (Chigbu et al., 2023).

This study will be conducted using a deductive approach whereby the literature will be used to create a theoretical structure of thought for testing. For the literature review, literature related to this study shall be critically evaluated in order to gain a discussion of relevant ideas and concepts that underpin the research, as well as to gather supporting evidence that the research topic and objectives are worthy of further investigation (Saunders, Lewis and Thornhill, 2009).

This literature review will describe the search strategy used and commence with a background on the research topic, which will be followed by a summary of the official recommendations on CPD for Radiographers by the European Federation of Radiographer Societies (EFRS). The concept of need and the various theoretical frameworks that underpin this idea will be analysed. Finally, a comprehensive analysis

of training need models will be performed in order to apply the appropriate model for RTTs working in the oncology field.

2.2 Search Strategy

Developing an effective search strategy plays a pivotal role when conducting a literature review, as it allows the researcher to obtain the most relevant and recent existing literature. For this literature review the first step of the search strategy involved compartmentalizing the research title to create keywords and search terms that underpin the general concept of this research. This was done by creating a concept map, thus a visual brainstorming of the research topic. The keywords included “training needs analysis”, “training needs models”, “continuous professional development”, “CPD”, “Radiotherapy”, “Radiographers”, “Radiation Therapists”, and “training need assessment”. The second step of the search strategy involved the use of Boolean operators (“and”, “or”, “not”) to combine keywords in order to refine the search to include only the keywords selected (Chigbu et al., 2023). The third step of the search strategy involved identifying the correct sources of existing literature. The main search engine used for this literature review was the University of Malta’s official search engine, HyDi, which provides free access to a variety of electronic databases which were used in conducting this literature review, including ProQuest Nursing & Allied Health Database, PubMed®, Sage Journals, Science Direct, Springer Link and Wiley Online Library. The majority of the literature reviewed included peer-reviewed articles and textbooks which were relevant to the research question. The fourth step involved reviewing the reference lists of already reviewed literature in order to find other relevant sources. Finally, the fifth and final step involved organizing the reference list using the ‘manage sources’ function on Microsoft

Word. The figure below shows a summary of the search strategy applied to conduct this literature review.

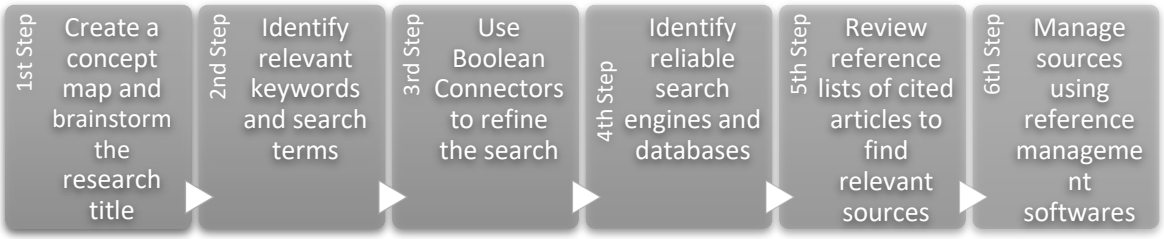

Figure 2.1: Search Strategy Summary (Author's illustration)

2.3 Background

The term 'Radiographer' defines a professional who is responsible for the justification and optimization of radiation exposures for the purpose of imaging and treatment. Radiographers are responsible for the well-being of patients throughout their journey and play a crucial role as professionals in ensuring that the patients and the public are protected from unnecessary irradiation in compliance with ALARA (As Low as Reasonably Achievable) Principle (EFRS, 2021). As recommended by the European Federation of Radiographers Societies, an organizational body representing over 100,000 radiographers across Europe, 'Radiographer' encompasses both professionals working in the medical imaging field and professionals working in the radiotherapy field (EFRS, 2021). Radiographers in the radiotherapy field will be the focus of this study and will thus be distinguished as Radiation Therapists (RTT). This profession in Malta is relatively new, owing to the fact that individuals aspiring to work in radiotherapy would previously require to travel for their tuition, limiting numbers greatly. In 2010, the undergraduate programme offered by the University of Malta, Bachelor of Science (Hons) in Radiography, which previously catered to radiographers in medical imaging only, was

adapted to include Radiotherapy in the curriculum. This was achieved through a collaboration with the University of Cardiff in Wales, and students were sent for a placement block period of six months to obtain their radiotherapy competencies. Today, the Radiotherapy department operates with 30 qualified RTTs.

2.3.1 The Role of a Radiation Therapist

The role of an RTT is to prepare and deliver high-energy radiotherapy treatments safely and accurately. This is permissible through the use of highly sophisticated technology and equipment. EFRS illustrates a general radiotherapy pathway (Figure 2.2 or Appendix A), including the responsibilities of the RTT (in yellow). This pathway is shared with the consultant clinical oncologist and the medical physicist, who form part of the Radiotherapy team.

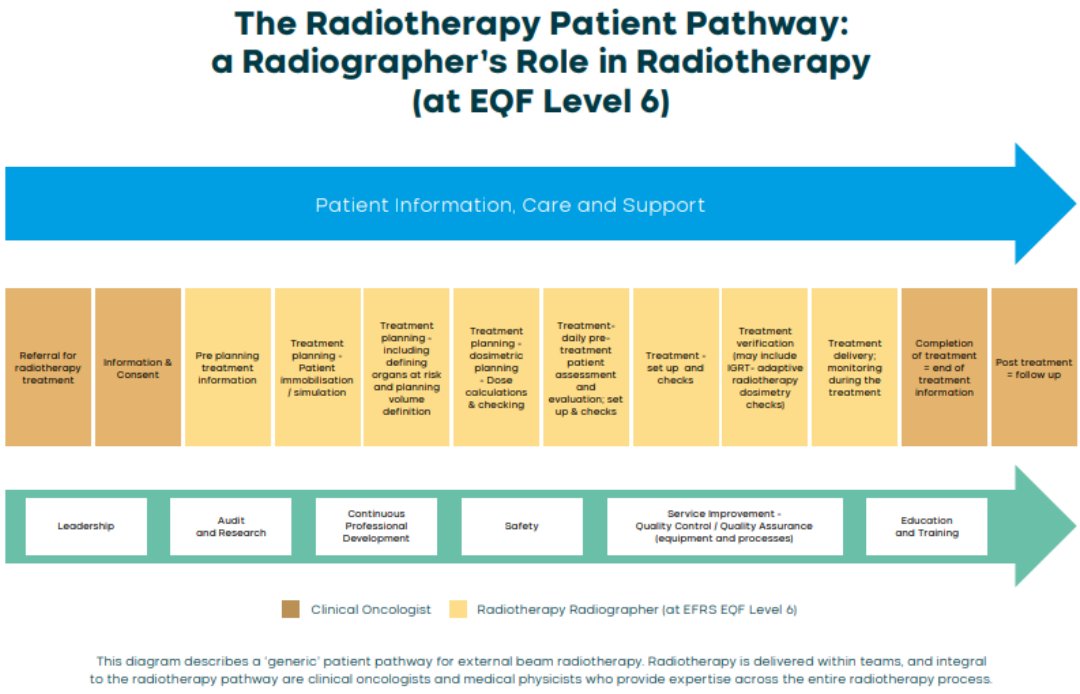

Figure 2.2: The Radiotherapy Patient Pathway: A Radiographer's Role in Radiotherapy (Available at https://api.efrs.eu/api/assets/posts/200 accessed 26th March 2023

When a patient is referred for Radiotherapy in Malta, the clinical consultant oncologist sends a referral to the Radiotherapy team via the oncology information system. At this stage, the RTT is responsible to perform the CT Simulation, a process that simulates the patient's treatment, including positioning and internal preparation. Here, the RTT is responsible to provide the patient with relevant information pertaining to the CT simulation. Ensuring that the patient positioning is optimized through the correct choice of immobilization devices is crucial, along with providing the patient with all the necessary information to achieve a reproducible treatment set-up. The simulated data is imported into the treatment planning system, where the organs at risk are delineated by the RTT using treatment contouring aids to obtain the most accurate volumes. Target volume delineation (delineation of the tumour) is performed by the consultant clinical oncologist, followed by treatment planning which is performed by the medical physics team. The complete finalized treatment plan is then checked by the RTT through treatment verification checks. The RTT also performs daily quality checks on the LINACs and treatment delivery, including patient set-up and image verification of the planned target volume and organs at risk. Moreover, RTTs are also responsible to monitor patient well-being and side effects, and provide necessary advice to both the patients undergoing treatment and their carers, which may last up to a month. The pathway may vary slightly depending on the treatment site and technique applied, and the treatment modality used. The radiotherapy profession is subject to continuous change owing to the significant technological advancements over the last decades, to an extent far greater than many other professions in the medical field. Therefore, RTTs must broaden their knowledge within their scope of practice (EFRS, 2021).

2.4 Continuous Professional Development for RTTs

Continuous professional development is a concept that has become increasingly popular within the context of career development as the need to sustain quality, increase efficacy and cost-effectiveness in service provision has expanded greatly (Neary & Johnson, 2016). As the online environment is providing easy access to information, patients are today more than ever before informed and aware of the different services and treatments provided to them and what they entail (Grehan et al., 2018). For this reason, the education and expertise achieved through undergraduate programmes, albeit important, are not enough to support the skills and competence required in the span of a healthcare provider's career (Zereshkian et al., 2019). The roles and responsibilities of RTTs are constantly changing and advancing, alongside the scope of practice (Grehan et al., 2018). In essence, the initial professional education received may no longer be useful in some aspects today. Not keeping up to date with new practices, particularly in a highly technology-based profession, could result in a lack of competence. The European Commission (2015) describes CPD as an "ethical obligation for all health professionals" to ensure the relevance of their clinical work and help to enhance patient outcomes and quality of care. CPD allows professionals to maintain and advance their knowledge, skills, and competencies (Castillo & Caruana, 2014). Walsh and Craig (2016) define CPD as a continuous process of education during which professionals acquire new skills and knowledge pertinent to their profession, which is then introduced into clinical practice. CPD is an ongoing process and is used interchangeably with lifelong learning and continuing education (EFRS, 2021). CPD provides an organized structure that permits improvement and development with various benefits to the organization and the

individual (Stevens, 2016). CPD promotes the discovery, utilization, and distribution of knowledge (Zereshkian et al., 2019).

There are various benefits of CPD for RTTs. Firstly, CPD may provide information on recent developments in the fast-transitioning field of technology in regard to radiotherapy planning and delivery. It may provide updates towards creating and maintaining a safe environment for both patients and staff. CPD may introduce new methods of treatment delivery in line with evidence-based practice. It allows RTTs to put a spotlight on their personal growth and career progression. Moreover, CPD brings professionals together and allows networking with other professionals, promoting the exchange of information on current and emerging practices (EFRS, 2021). Finally, CPD encourages personal confidence, motivation, and credibility, particularly when presenting own achievements (Stevens, 2016).

CPD may be delivered through many different formal and informal methods. Neary (2016) recognized three different types of CPD. 'Operational CPD' are activities that are imposed by the employer. 'Experiential CPD' are activities that indirectly develop knowledge and skills within the everyday practice and 'formal CPD' are those activities that involve attendance to officially recognized activities. The EFRS (2021) lists them as follows:

1. Work-based learning – audits, journal clubs, and participation in multidisciplinary meetings;
2. Reflective practice;
3. Individual learning – journal reading and online learning (e.g., webinars);

4. Attending conferences, courses, seminars, and workshops;
5. Presenting scientific work through articles and conferences;
6. Conducting or participating in radiographer-led research.

A study on CPD attendance, attitudes, and motivators conducted on medical imaging radiographers in Malta by Castillo and Caruana (2014), concluded that 75% of radiographers believe that there is a limited range of CPD activities available specific to radiography. Thingnes & Lewis (2011) argue that lifelong learning and continuing professional development should act as an incentive to explore the learning needs of radiographers to guarantee the best use of CPD programmes and frameworks. Castillo and Caruana (2014) also argue in favour of CPD programmes developed by professional bodies or individuals which follow learning needs self-assessment on radiographers. CPD programmes would periodically need to be updated to ensure that they are in line with emerging practices (Zereshkian et al., 2019). This finding strengthens the argument that training needs assessment is required for an appropriate and relevant CPD programme, even more so for a smaller group of RTTs who have come into full operation only since 2014.

2.4.1 Continuous Professional Development's Role in Enhancing Professional Competence

There is repeated use of the term 'competence' when describing CPD. Competence is defined as the ability to perform an appropriate task through acquired knowledge and skills (Bolderston, 2007). There are two aspects of competency in relation to professional behaviour. The first one is that an individual must be competent to begin acting in a

professional capacity, and the second is that competency must be maintained in order to continue doing so (Allan & Moffett, 2015).

Allan and Moffett (2015) apply the conscious competence cycle matrix (Figure 3) in the context of career development.

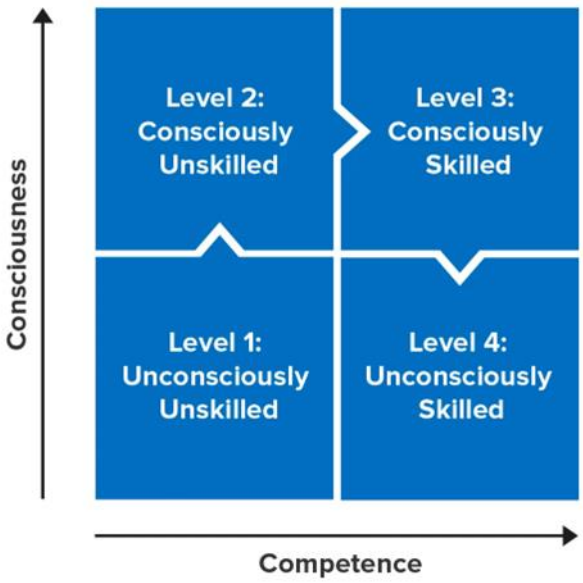

Figure 2.3: Conscious Competence Cycle (Available at https://www.mindtools.com/ah651dp/the-conscious-competence-ladder accessed 29th March 2023)

This model puts the focus on consciousness (awareness) and competence (level of skill). In short, at the first stage of the cycle i.e., when a person is exposed to a new skill, despite being open to learning, there is a lack of awareness of the tasks required and their ability to perform them (unconscious incompetence). In the second stage, the learner becomes aware of the skill, however, they also become aware of the lack of competence thereof (conscious incompetence). There is an element of anxiety in this stage for the learner as they would be often uncertain of their abilities and may tend to refer to colleagues. In the

third stage, the person begins to perform the skill yet there is an awareness that they need to practice in order to perform the new skill confidently (conscious competence). Eventually, in the final stage, that skill becomes automatic and the person can perform it without placing much thought into it (unconscious competence). The state of unconscious competence may become precarious, particularly as the person may not recognize the need to remain active in their learning in order to maintain the skills. The state of unconscious competence would need to be occasionally assessed in order to ensure compliance with new standards. For this reason, CPD can be considered a strategy to attain competence by promoting self-consciousness and accountability (EFRS, 2021). This creates an environment that enhances professional competence.

2.4.2 Benefits of Continuous Professional Development for the Patient

Irrespective of the route the learning takes, CPD as a method to promote continual learning and personal development throughout a career should bring patient benefit as the ultimate end result (Grehan et al., 2018). For Radiotherapy to be delivered with equity, quality, and safety, education and training are essential (Coffey et al., 2022). It is every patient's right to receive equal quality treatment and to be treated by a competent workforce who is equipped with up-to-date knowledge, skills, and competencies (EFRS, 2021) to be able to link clinical and technical aspects of treatment delivery to provide enhanced quality, and patient-centred service.

2.4.3 Benefits of Continuous Professional Development for Organisations

The benefits of CPD are not only associated with the individual or the patient but also with the organization. CPD leverages the potential of staff, limiting errors and encouraging staff development which promotes satisfaction and creates a sense of motivation and self-confidence (Stevens, 2016). CPD allows employees to achieve SMART (specific, measurable, achievable, realistic, and time-bound). A competent workforce provides an outstanding performance at the workplace and consequently adds value and honour to the organization (Stevens, 2016).

Employers should allow the funding of CPD activities involving education and training that is pertinent to the provision of service (Coleman, 2008). Protected study time as appropriate should also be provided. Notwithstanding that the majority of an employee's CPD should reflect on sustaining knowledge, skills, and competencies relevant to their current role, managers should also endorse employees to undertake aspirational CPD that may have no obvious benefit to the organization (Coleman, 2008).

2.5 EFRS Recommendations on Continuous Professional Development

Radiography societies in the European Union are beginning to realize the value of CPD in ensuring a capable, qualified, and safe workforce in all aspects of radiography practice. In a recent EFRS survey, 91% of professional bodies agree that it would be beneficial to establish a European CPD framework, providing a clear direction for the creation of CPD guidance recommendations (Wareing et al., 2017). In 2021, the EFRS published a

document on CPD that included a comprehensive list of general recommendations (table 2.1) and guidance on documentation (table 2.2), and CPD content guidance (table 2.3).

CPD Overarching Recommendations
1. CPD activity, and providers, must facilitate a range of options which respect socioeconomic constraints by including recognised CPD activity which bears no financial cost to participants.
2. CPD activity which bears financial cost is the personal choice of participants.
3. Professional societies have a responsibility to provide CPD opportunities for their members.
4. A flexible approach to CPD is recommended, a spectrum of potential activities is encouraged.
5. CPD activity can be credit or outcome based, a mixed model approach is recommended. The main focus of CPD activities should be on their relevance to practice enhancement.
6. The participant needs to provide the justification for each CPD activity and evidence its' alignment to their practice. To ensure clarity of CPD relevance an initial section in the CPD records which outlines the participant's current professional role is required.
7. CPD opportunities offered by professional societies need to encompass the spectrum of specialities in medical imaging, nuclear medicine, and radiotherapy so all participants have options relevant to their own practice.
8. CPD opportunities to promote "Work Life Balance" principles are encouraged e.g. lunchtime journal clubs.
9. CPD activity planning needs to be realistic and aligned to local resources. CPD resourcing should involve communication between professional societies, clinical departments and academic partners. Collaboration in developing, enhancing and supporting CPD activity is recommended.
10. Professional societies, clinical departments and academic partners should promote and encourage CPD activity and develop appropriate mechanisms of incorporating CPD activity in appraisal/professional review processes.

Table 2.1: CPD Overarching Recommendations (EFRS, 2021)

CPD Documentation Recommendations			
Written Evidence	**Format of Records**	**Review of Records**	**Archiving of Records**
1. A record of written evidence is required for CPD activity whether it is credit or outcome based. 2. National language. 3. Word limits are recommended for individual entries. Maximum of 1,000 words per entry. 4. Typed text formatting. 5. Scanned certificates are recommended as acceptable. 6. A minimum of one CPD entry for every three month period is advised.	1. Records should be kept using either mandatory templates or in a format that facilitates the required information. 2. Digital or hardcopy document file requirements must be specified at national level in the case of state registration governance. 3. Formal national CPD guidelines should be provided for referral. 4. Critical self- reflection is included in all CPD entries.	1. Audit of all registered radiographers in jurisdictions where CPD is mandatory is supported and should be completed by random selection. 2. A team of reviewers is recommended for audit of individual portfolios and official reports are required. 3. In jurisdictions without mandatory state regulation professional or employer regulation is recommended e.g. CPD review as part of staff appraisal in the workplace.	1. Audited reports should be archived by the relevant Professional society or the regulating body (or filed as image appraisal documentation in the case of imaging department review). 2. Annual reporting of audit activity and compliance is recommended as appropriate. 3. Feedback / feed-forward reports should be made available to radiographers being audited. 4. Individuals need to maintain certified certificates for each CPD audit period.

Table 2.2: CPD Documentation Recommendation (EFRS, 2021)

CPD Content Recommendations			
Patient	**Individual**	**Service**	**Profession**
Plan & Discuss:			
Motivation for activity focussing on how patient examinations/care will be enhanced.	Personal motivation for undertaking the CPD activity.	How the activity will benefit the imaging service provided.	The benefit gained for the profession.
State:			
How the knowledge, skills or competencies gained will benefit the patient.	How the knowledge skills or competencies involved in the activity improve personal practice.	How the impact on personal practice benefits the imaging service provided.	Positive outcomes for the profession.
Reflect:			
On how the activity has impacted on professional behaviour or perceptions when interacting with patients.	On any changes in professional practice upon completion of the CPD activity.	On how changes in behaviour/perceptions have impacted upon the imaging service provided.	On outcomes/impact for the profession.
Comment:			
On the format of CPD activity and its appropriateness for the aims of the CPD activity and the suitability of the learning space used e.g. case study review in department; formal course in college; journal reading at home.	On why this model of CPD activity was selected and justify the appropriateness. Include drivers e.g. flexibly of activity undertaken, low cost and barriers e.g. cost, access to resources etc.	On how the imaging service supported the activity and what further steps could be taken to improve support mechanisms.	On how the profession supported the activity and what further steps could be taken to improve support mechanisms.
Consider:			
How alternative forms of CPD would support similar outcomes in relation to patient examination/care. Include a reflection of any perceived barriers to alternate forms of activity.	How your CPD activity is meeting a multi modal and model approach and whether there are barriers preventing potential diversity and why.	How your imaging department could support diversity in your approach to CPD.	How your professional society could approach diversity in your approach to CPD.

Table 2.3: CPD Content Recommendations (EFRS, 2021)

2.6 Theoretical Framework

2.6.1 The Concept of Need

The concept of need is discussed in several academic disciplines, particularly psychology, sociology, and economics. 'Need' as a term cannot be defined in a factual manner (Carver et al., 2008) and is considered ambiguous (Bradshaw et al., 2013). Many viewpoints and ideas have been put forth to explain the nature and purpose of human needs, resulting in an evolution in the theoretical framework surrounding this concept across time. Table 2.4 provides a summary of the different frameworks over time.

Abraham Maslow (1943)	Hierarchy of Needs	Physical, protection, love/belonging, esteem, self-actualization
Jonathan Bradshaw (1972)	Taxonomy of Needs	Normative, Felt, Expressed, Comparative
David McClelland (1976)	Motive Disposition Theory	Power, affiliation, achievement
Richard Ryan & Edward Deci (1985)	Self-Determination Theory	Relatedness, Competence, Autonomy

Table 2.4: Summary of notable need theories over the years.

Abraham Maslow's (1943) hierarchy of needs hypothesis is one of the earliest and most significant theories of need. Maslow asserts that people possess five different types of needs: physical, protection, love/belonging, esteem, and self-actualization. According to Maslow's hypothesis, after the most basic needs of an individual are satisfied, new wants arise and serve as the source of motivation (Navy, 2020). Maslow's idea remains a cornerstone concept and has been utilized and explored extensively.

Jonathan Bradshaw (1972) in his taxonomy of needs classifies needs into four divisions. Normative needs are those needs that are described by specialists for a specific case. Felt needs are personal and therefore subjective to the individual and are generally associated with the term ‘want’. Expressed needs are those felt needs (wants) that are turned into an act or request. Finally, comparative needs are those needs that are measured by a comparison of groups or individuals of similar attributes (Bradshaw et al., 2013).

The social needs theory established by David McClelland (1976); Motive Disposition Theory is yet another theoretical viewpoint on the idea of need. According to McClelland, people need power, affiliation, and achievement in order to function as social beings. Affiliation alludes to the need for social connections and relationships. Accomplishment refers to the need to succeed and flourish, and power refers to the need to establish authority and dominance. In organizational psychology, McClelland's hypothesis has been applied to account for individual variances in work motivation and conduct.

The notion of need is approached from a variety of theoretical angles. According to Richard Ryan and Edward Deci's self-determination theory, people have three fundamental psychological needs: relatedness, competence, and autonomy. Competence is the need to be effective in one's activities, relatedness is the need for support networks, and autonomy is the necessity to control one's own life. The self-determination theory contends that fulfilment of these fundamental psychological needs is necessary for motivation, well-being, and personal development (Deci & Ryan, 2015).

In order to determine the training requirements for RTTs continuous professional development, Ryan and Deci's self-determination theory offers a strong basis to establish

a comprehensive understanding by virtue of the perspectives of relatedness, competence, and autonomy which are relevant requirements with respect to the study topic.

2.7 Training Needs Assessment

Training needs assessments in the workforce aid to ensure self-assurance, expertise, and a wide range of competencies that strengthen the employees both on an individual level and on a team basis in any organization (Markaki et al., 2021). Time, cost constraints and lack of evidence-based research are factors that have hindered healthcare institutions in conducting comprehensive assessments of training needs (Grimshaw et al., 2012). For training needs analysis to be relevant to the ever-evolving departmental exigencies and practices, it must be conducted within the framework of current healthcare systems (Joly et al., 2018).

There is ample literature on training needs among healthcare professionals and multiple training needs models have been established over the years (Carlisle et al., 2012), notably the traditional model and practical model. The traditional model concentrates on task analysis and employee behaviour. Its fundamental flaw is that it relies on pre-set results, preventing opportunities for spontaneous learning, as well as being cumbersome (Carlisle et al., 2012). The practical model, on the other hand, concentrates on the trainer in terms of demand or supply and allows the trainer to apply the most appropriate strategy to achieve the preferred result. The main drawback to this model, however, is that it provides no instructions on how to devise the actual assessment (Markaki et al., 2021).

The Hennessy-Hicks Training Needs Analysis (H-HTNA), was designed to address the issues encountered by previous models. The H-HTNA concentrates on the organizational,

group, and individual level requirements, and enables prioritization of training needs. This tool, in questionnaire format, has been associated with reduced response bias and offered data that is relevant to present performance status, highlighted areas of deficiency, and how to address them. The H-HTNA was licensed by the World Health Organization and disseminated online via the Workforce Alliance website and has been used in several studies concerning healthcare, for this reason, it can be concluded that H-HTNA is the ideal tool to apply for this research project. The data from this questionnaire will enable the radiotherapy department to prioritize competency-deficient areas of practice, as well as the formation of an adequate continuous professional development programme.

2.8 Conclusion

In summary, the radiotherapy profession is dynamic by virtue of continuous technological advancements. RTTs must therefore remain up-to-date and competent throughout their careers. CPD enables professionals to sustain their skills, knowledge, and competence with several benefits to the individual, the organization, and ultimately the patient. CPD may also be considered a strategy to achieve competence by encouraging self-consciousness and accountability. Professional bodies should develop CPD programmes that are in line with current levels of practice, and this may be achieved by conducting training needs assessments.

Chapter 3 - Methodology

Chapter 3 – Methodology

3.1 Introduction

This chapter is intended to provide a detailed account of the methodology applied to conduct this research. This includes the research philosophy, design, objectives, and data collection and analysis. This study was performed through appropriate research rigour and taking into account any ethical considerations.

3.2 Research Philosophy

Different methodologies are employed in many disciplines of study to investigate phenomena and gather data: namely quantitative and qualitative research methods. Each approach has its own advantages and disadvantages, giving academics various avenues for examining and comprehending the social world.

In order to reach findings and establish generalizations, quantitative research mainly focuses on gathering and analysing numerical data. With this strategy, correlations, patterns, and trends between variables are quantified (Creswell & Creswell, 2023). The ability of quantitative research to produce unbiased and trustworthy data is one of its key advantages (Xiong, 2022). Quantitative researchers can reduce bias and improve the generalizability of their findings by using large sample sizes and random sampling approaches. This neutrality makes research more replicable and makes it easier to compare and synthesize findings from various investigations. Additionally, by using experimental plans and statistical analysis, quantitative research enables researchers to

look at causal linkages and evaluate ideas (Xiong, 2022). This rigorous process offers a solid basis for decision-making, the creation of policies, and evidence-based practice across a range of disciplines.

Qualitative research collects non-numerical information to delve deeper into and comprehend social processes. This approach makes use of tools including focus groups, observations, document analysis, and interviews (Bell et al., 2019). An understanding of social phenomena in their context is possible thanks to qualitative research. It places a strong emphasis on examining people's experiences, viewpoints, and social interactions within certain circumstances. This method offers thorough and in-depth insights into the social world's intricacies. Additionally, it acknowledges the researcher's subjective interpretation and actively engages in data analysis to find trends, themes, and meanings (Neuman, 2020).

Quantitative research may be simplistic and fall short of capturing the complexity of social events, but it does offer objectivity, generalizability, and the ability to show causal linkages. Important contextual elements and personal experiences might be missed. On the other hand, qualitative research offers in-depth comprehension of social phenomena within their unique contexts as well as extensive descriptive analyses. However, because of the frequently employed small sample sizes, it can be time-consuming, susceptible to researcher bias, and its results may not be easily generalizable (Babbie, 2021).

Finally, the method selection should be based on the goals, questions, and characteristics of the phenomenon being investigated. Mixed methods research, which combines the two

approaches, can offer a thorough and multifaceted knowledge of complex social processes (Creswell & Creswell, 2023).

3.3 Research Design

This study will collect primary data. The collection of primary data gives researchers complete control over the data collection process, ensuring the accuracy and reliability of the data (Hair et al., 2019). In addition, primary data offers the chance to collect original and distinctive insights that haven't been previously documented, enabling novel discoveries and advancing the body of knowledge on the subject (Bell et al., 2019). Researchers can increase the correctness and validity of their research findings by using primary data to guarantee that their conclusions are founded on current and contextually relevant knowledge (Hair et al., 2019).

Data for identifying the status of phenomena or interactions between phenomena at a specific point in time can be obtained by descriptive cross-sectional research. Individuals may participate in cross-sectional studies should they be in accordance with the inclusion and exclusion criteria as identified by the researcher, who will then perform the research to evaluate exposure and results (Ihudiebube-Splendor & Chikeme, 2020).

The primary data will be collected using a mixed-methods approach, integrating both quantitative data and qualitative data to provide an in-depth understanding of the research problem (Creswell & L., 2018). According to Creswell and Plano Clark (2018), this design enables the investigation of subjective experiences, meanings, and social contexts (qualitative), as well as statistical analysis and the generalizability of findings

(quantitative). Additionally, mixed-methods research gives researchers the opportunity to balance the advantages of one method's limits with the weaknesses of another, resulting in a more accurate and reliable interpretation of the data (Johnson & Onwuegbuzie, 2004).

3.4. Research Methodology Objectives

i. To identify an appropriate research tool to obtain the data;
ii. To perform a pilot study on the selected tool;
iii. To invite participants to respond to the research tool;
iv. To obtain a 100% response rate (all RTTs to complete the questionnaire).
v. To identify data analysis techniques;
vi. To abide by ethical requirements during the collection of the data.

3.5. Data Collection

The data will be collected during the period June-July 2023, in the form of a paper questionnaire. The research intermediary will invite the participants to fill in the questionnaires during this time. Participation is voluntary and anonymous, and information on how to complete the questionnaire will be provided.

3.5.1 Sample Population

For the purpose of this research, the intention is to include the entire population. Since this is a small, well-defined group, obtaining replies from all members of the population is manageable.

The research participants will be chosen from the local radiotherapy department. A total of 29 participants will be invited to take part in this research. In order to be eligible for participation in this study, all volunteers must meet the following criteria:

Inclusion Criteria:

i. Participants should be all RTTs working at the local Oncology hospital, Radiotherapy Department;
ii. Participants must have at least one year of experience working as RTTs in Radiotherapy.

Exclusion Criteria

i. All RTTs who do not practice radiotherapy;
ii. Newly recruited RTTs who have been working for less than a year.

3.5.2 Research Tool

The research tool that will be utilized for this study is The Hennessy-Hicks TNA Questionnaire and Manual. This tool was developed by Professor Carolyn Hicks and Dr. Deborah Hennessy from the University of Birmingham in 1996 and is a psychometrically valid tool that has been approved by the World Health Organisation (WHO) as a well-founded and reliable tool for healthcare professionals in any given setting (Holloway et al., 2018).

The tool is made up of four distinct components that help users better identify their training needs and preferred performance enhancement techniques (Holloway et al., 2018). Two of these components deal with skilled activities (judgment of importance and evaluation of present performance), while the other two take into account possible development mechanisms (such as specialized training or regulatory changes) (Holloway et al., 2018). Researchers can modify the tool to focus on their particular areas of interest by following the extensive instructions provided in the handbook that goes along with it. Participants are asked to rate each of the indicated skilled tasks on a 7-point Likert scale (1 being the lowest and 7 being the highest) (Holloway et al., 2018). The thirty listed skills can be grouped into a number of categories as follows:

1. Clinical tasks;
2. Communication and Teamwork;
3. Research and Audit;
4. Administrative and Personal.

The second section invites the participant to list down up to 10 specific skills, or activities in which they wish to receive further training, in order of importance. This section is open-ended, meaning the participant is free to list his/her specific training needs and requirements and involves the qualitative aspect of the study.

3.5.3 Validity and Reliability

Markaki et al (2021) critically evaluated The Hennessy Hicks TNA's impact on CPD across a range of disciplines, environments, and nations. The instrument showed

flexibility for a variety of uses and circumstances without compromising its exceptional validity and reliability. Because of its adaptable design, it was simple to adapt to other populations, environments, and cultures while keeping its psychometric properties. As a result, the tool's potential as a means for analysing training needs in the healthcare and education sectors on a global scale became clear.

Overall, the Hennessy Hicks TNA questionnaire data analysis combines quantitative and qualitative methodologies to provide an in-depth understanding of the target group's training requirements. The findings can guide the creation of efficient training initiatives as well as prioritize CPD programmes designed to fulfil the identified gaps and enhance organizational performance (Markaki et al., 2021)

3.5.4 Pilot Study

One Radiation Therapist was recruited for the pilot study and asked to complete the Hennessy Hicks TNA questionnaire. Through a pre-written feedback form (Appendix B), input from the participant about the clarity, relevance, length and appropriateness of the questionnaire items was gathered. This advice allowed the improvement of the questionnaire to ensure it was appropriate for the main study. The questionnaire design was slightly modified as a result of the pilot study's findings. The pilot study improved the validity and reliability of the research by addressing potential concerns and enhancing the research tool.

3.6 Data Analysis

In order to glean useful insights from the data gathered for the Hennessy Hicks TNA questionnaire, statistical techniques and thematic analysis were used for the data analysis. The purpose of the questionnaire is to determine the training needs of a group or an individual inside an organization.

The first step in the data analysis process involved categorizing and cleaning the data. This entailed going over the responses, making sure the data is accurate, and looking for any missing or incorrect information. The data was computed into Microsoft Excel.

The data gathered by the questionnaire was summarized by means of descriptive statistics. These statistics provide a thorough overview of the replies from the participants and contain measurements like frequencies, percentages, averages, and standard deviations. Descriptive statistics constitute an essential first step in conducting analysis of data and should always be performed prior to applying inferential statistics (Kaur et al., 2018). Additionally, the Hennessy Hicks TNA questionnaire frequently contains Likert scale items that gauge participants' degrees of agreement or disagreement with particular claims. Determining the mean, median, and mode scores for each item, examining item inter-correlations, and determining the reliability of the entire scale are all possible methods of analysing these Likert scale replies.

In order to find statistically significant differences or correlations between variables, the statistical tests used was the Kruskal-Wallis. This is a nonparametric hypothesis test that compares three or more independent groups. It is also known as one-way ANOVA on

ranks. This is an extension of The Mann Whitney U nonparametric test, which can only compare two groups (Frost, 2023). Non-parametric statistics, or distribution-free statistics, involves those tests which do not assume a distribution of the data in order to obtain an analysis (Scheff, 2016).

Thematic analysis was applied to qualitative data gathered through open-ended questions or comments to increase the analysis's depth. This involved finding repeating themes, patterns, and developing concepts within the qualitative responses, which resulted in a deep and complex understanding of the participants' training requirements.

3.7 Rigour in Research

A key component of performing high-quality research is rigour, which ensures the accuracy and dependability of the results. Research rigour, according to Polit and Beck (2021), relates to the meticulousness and accuracy of the research design, data-gathering techniques, and data analysis methodologies. To reduce bias and improve the trustworthiness of the research findings, it entails following strict guidelines and applying methodical techniques (Creswell & Creswell, 2023). To ensure rigour, researchers might use a variety of techniques, including triangulation, member verification, and peer review. According to Denzin (1978), triangulation entails using various data sources, methodologies, or viewpoints to confirm findings, enhancing the validity and dependability of the outcomes. Lincoln and Guba (1985) advocated member checking, which comprises asking participants for comments to confirm the validity and interpretation of the data that was gathered. This increases the credibility of the study. Peer review, a common technique in academia, is submitting the research for critical

assessment by subject-matter specialists in order to detect any errors, biases, or gaps, enhancing the rigour and credibility of the research (Greenhalgh & Papoutsi, 2018).

3.8 Ethical Considerations

The rights, privacy, and well-being of participants were all protected by ethical considerations, which are of utmost importance in research. To perform the data collection ethically, the participant's right to privacy and confidentiality was preserved through the anonymous nature of the data collection. In the public domain, no identifying characteristics were revealed. Compliance with the management of data was followed as all the questionnaires were stored in a cabinet with a key which only the researcher could access. Furthermore, only the researcher had access to the computer to store and handle all the data analysis. Participants were provided with informed consent and appropriate support. Finally, participants had the right to withdraw if they felt uncomfortable participating**.**

The permissions and ethical approvals that have been acquired to conduct this study are listed below:

i. University Research Ethics Committee Approval;
ii. Faculty Research Ethics Committee Approval;
iii. Permission request letter to the Chief Executive Officer at Mater Dei Hospital;
iv. Permission request letter to the Oncology Chairperson at Sir Anthony Mamo Oncology Centre;

v. Approval from the Professional Lead (Radiotherapy) at Sir Anthony Mamo Oncology Centre.

vi. Approval from the Data Protection Officer at Mater Dei Hospital

vii. Approval from the Human Resources Manager at Sir Anthony Mamo Oncology Centre

viii. Approval from the Quality Manager at Sir Anthony Mamo Oncology Centre

3.9 Conclusion

In conclusion, the methodology chapter lays the groundwork for this study's execution by offering a comprehensible framework for the collection, analysis, and interpretation of data. The thorough and orderly methodology used in this study strives to guarantee the validity, generalizability, and trustworthiness of the results, thereby adding to the body of knowledge in the subject.

Chapter 4 - Results

Chapter 4 – Results

4.1 Introduction

In the preceding chapters, the theoretical foundations and methodological framework that served as the research's road map were explored. This chapter presents the findings of this research - the culmination of the data collection, analysis, and interpretation come together in this chapter to reveal a deeper knowledge of the research study.

This chapter will present the results in two phases. Phase 1 will present the results obtained by statistical analysis from the first part of the questionnaire i.e., the quantitative aspect, while phase 2 will present the thematic analysis obtained from the second part of the questionnaire i.e., the qualitative aspect.

For the purpose of the research, the whole population (all the RTTs) participated in the study, accounting for 28/30 RTTs. This excluded the person who performed the pilot study and the researcher.

4.2 Phase 1 – Statistical Analysis

An analysis of the data using statistical tests and bar charts was performed to assess the research questions contained in the questionnaires with assistance from a statistician.

There are varying years of experience among the participating RTTs (Table 4.1), for this reason, they were classed by years of experience as follows: less than 5 years (7 RTTs),

5 to 10 years (18 RTTs) and 10+ years of experience (3 RTTs), in order to gain more insight into each cohort and the tasks in which they feel less confident and their relative importance.

Table 4.1 – Experience in present role (years)

	Number of Participants: 28			
Years in Current Post	**Min**	**Max**	**Mean**	**Std. Deviation**
	2	35	8.25	6.559

4.2.1 Descriptive Statistics

The questionnaire used involved the participant rating 30 tasks using a Likert scale of 1-7 (1 less important and 7 most important). For each task, the rating was required for four different questions:

- A – Please give a rating stating how important you consider this particular activity to be for the successful performance of your job;
- B – Please give a rating stating how well you consider that you currently perform this same activity;
- C – Please give a rating stating how important you consider training courses to be in improving the performance of this same activity;
- D – Please give a rating stating how important you consider your organisation's input in improving the performance of this activity.

Charts 4.1 and 4.2 provide the score distribution of the ratings of the questionnaire items, Chart 4.1 represents the ratings of the whole group, while Chart 4.2 represents the ratings according to years of experience.

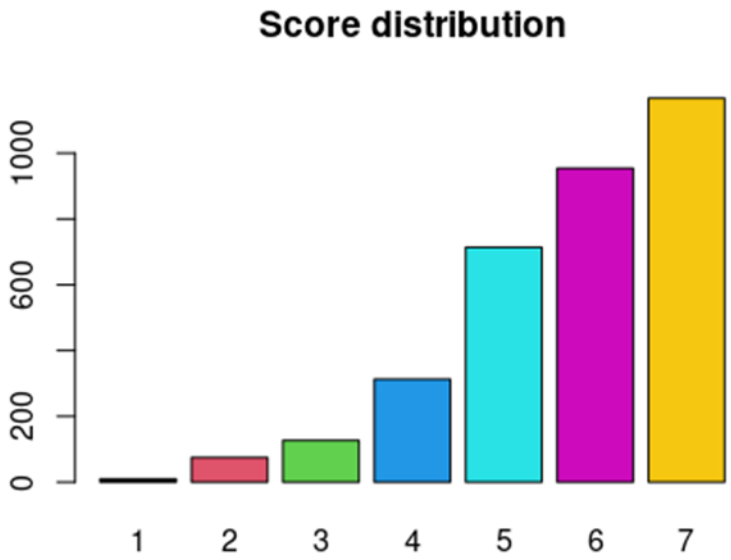

Chart 4.1: Frequency versus Score

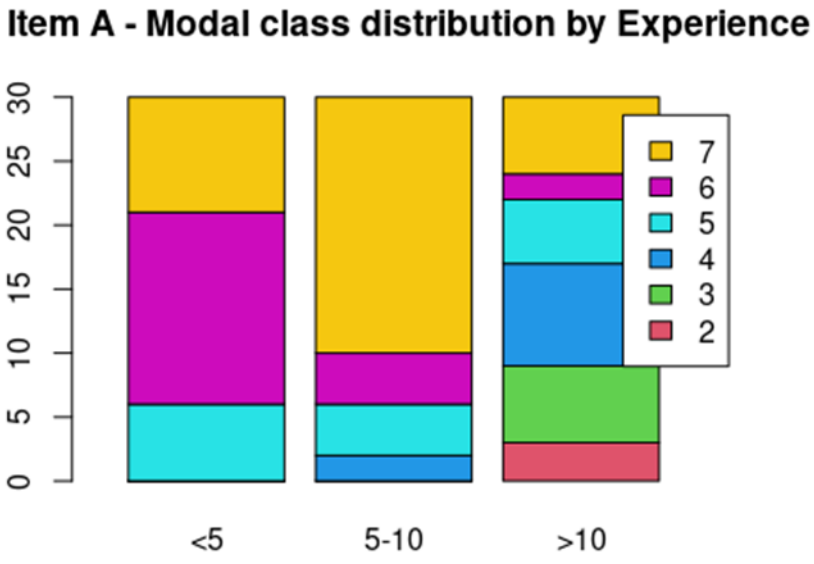

Chart 4.2: Question A Mode Class Distribution by Experience

The charts showed that the response to the questionnaires was strongly negatively asymmetric. There was an inflation toward higher scores and therefore arithmetic average was not utilized. It could also be noted that the 7-class Likert scale seemed to have too many categories. The stacked histogram in Chart 4.2 indicating the top 4 ratings (from 4 to 7), covered 85% of the selected ratings. For this reason, the modal class and its frequency in the sample have been used as the reference metric. In statistics, the term ‘modal class’ refers to the highest frequency class. In a continuous quantitative statistical variable distribution where values are classified into classes with similar dimensions, it refers to a class where the frequency is highest. The frequency (p_mod) refers to the percentage of RTTs answering as the mode value for each task.

4.2.2 Kruskal-Wallis Test

The Kruskal-Wallis test, created by Kruskal and Wallis in 1952, is a non-parametric method for determining if samples are taken from the same distribution (Xia, 2020). The Kruskal-Wallis test's null hypothesis is that the groups' mean ranks are equal. Rank is the number that identifies a value in a list that is ordered in a particular manner (often decreasing) (Weisstein, 2023). Kruskal-Wallis test is referred to as one-way ANOVA on ranks, the non-parametric counterpart of one-way ANOVA (Xia, 2020). The non-parametric Kruskal-Wallis test doesn't rely on the underlying data having a normal distribution unlike the comparable one-way ANOVA (Xia, 2020). The term "P value" refers to the probability of obtaining a result under the null hypothesis that is equal to or substantially greater than what was actually observed. The probability (P) indicates the likelihood that any observed variation between groups is the result of chance (Dahiru, 2011). If the p-value is larger than the standard significance level of 0.05, the null

hypothesis is retained (Frost, 2023). Alternatively, if the value is observed to be smaller than 0.05 the null hypothesis that all groups have the same rank is rejected, in that at least one group ranked differently than the others (Frost, 2023).

4.2.3 Question A (Please give a rating stating how important you consider this particular activity to be for the successful performance of your job)

Table 4.2 below is a ranking of the tasks the participants considered most important for the successful performance of the job. Since many participants answered using high ratings for most of the tasks, the mode i.e., the most frequently occurring value was used to identify the rankings.

Table 4.2: Ranking Question A

Rank	Task	Category	Modal Class	p_mod
1	Treating Patients	Clinical Tasks	7	0.929
2	Working as a Member of a Team	Communication & Teamwork	7	0.893
3	Communicating with Patients face-to-face	Communication & Teamwork	7	0.750
4	Assessing Patients' Clinical Needs	Clinical Task	7	0.714
5	Planning and organizing an individual Patient's Care	Clinical Task	7	0.679
6	Giving information to the Patient and/or Carers	Communication & Teamwork	7	0.679
7	Establishing a Relationship with Patients	Communication & Teamwork	7	0.607
8	Using Technical Equipment including Computers	Administrative & Personal	7	0.607
9	Applying Research Results to Your Own Practice	Research & Audit	7	0.571
10	Evaluating Patients' Psychosocial and Social Needs	Clinical Task	7	0.536
11	Personally Coping with Change in Health Service	Administrative & Personal	7	0.500
12	Showing Colleagues and/or Students how to do things	Communication & Teamwork	7	0.464
13	Organizing your Own Time Effectively	Administrative & Personal	7	0.464
14	Accessing Research Resources	Research & Audit	7	0.393
15	Interpreting your own Research Findings	Research & Audit	7	0.321
16	Writing Reports of Your Research Studies	Research & Audit	7	0.321
17	Providing Feedback to Colleagues	Communication & Teamwork	6	0.500
18	Getting on with your Colleagues	Communication & Teamwork	6	0.464
19	Introducing New Ideas at Work	Communication & Teamwork	6	0.429
20	Appraising your own Performance	Administrative & Personal	6	0.393
21	Accessing relevant Literature for your Clinical Work	Research & Audit	6	0.357
22	Critically Evaluating Published Research	Research & Audit	6	0.357
23	Doing Paperwork and/or Routine Data Inputting	Administrative & Personal	5	0.571
24	Designing a Research Study	Research & Audit	5	0.429
25	Making Do with Limited Resources	Administrative & Personal	5	0.393
26	Undertaking Administrative Activities	Administrative & Personal	5	0.321
27	Collecting and Collating Relevant Research Information	Research & Audit	5	0.286
28	Statistically Analyzing Your Own Research Data	Research & Audit	5	0.286
29	Undertaking Health Promotion Activities	Administrative & Personal	5	0.286
30	Identifying Viable Research Topics	Research & Audit	5	0.250

The Kruskal-Wallis test at p-value 0.04589 indicated low evidence in favour of different scores by years of experience. The highest-ranking tasks in order according to the results in the data above are *"Treating Patients", "Working as a Member of a Team"* and *"Communicating with Patients Face-to-Face".*

4.2.4 Question B (Please give a rating stating how well you consider that you currently perform this same activity)

Question B involved the participants in rating how well they believe they currently perform the listed activities (Chart 4.3). The level of confidence of the participants in how well they perform each task varied with experience. It can be noted that as the years of experience increase, the level of confidence in performing tasks decreases (Kruskal-Wallis test, p-value =0.001274).

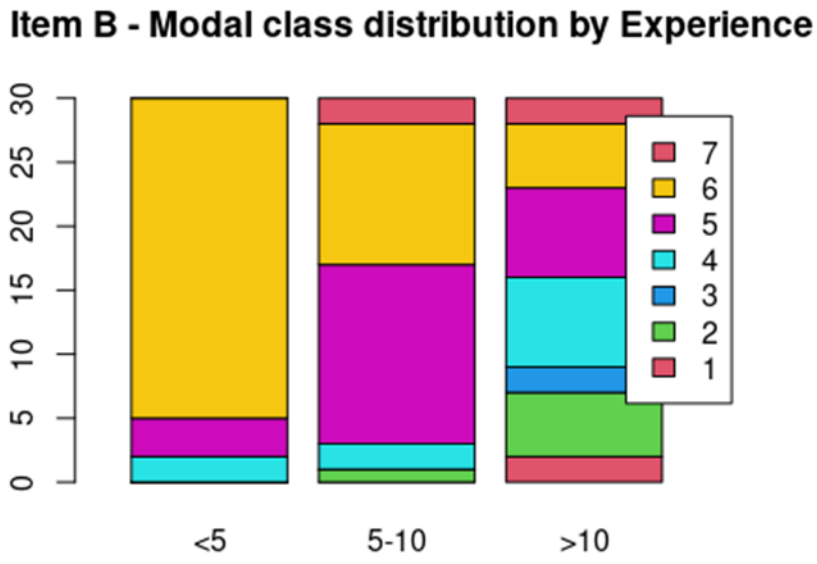

Chart 4.3: Question B Modal Class Distribution by Experience

Table 4.3: Ranking Question B Tasks by <5 Years of Experience

Rank	Task	Category	Modal Class	p_mod
1	Getting on with your Colleagues	Communication & Teamwork	6	1.000
2	Identifying viable Research Topics	Research & Audit	6	0.857
3	Accessing Relevant Literature for your Clinical Work	Research & Audit	6	0.857
4	Interpreting your own Research Findings	Research & Audit	6	0.857
5	Assessing Patients' Clinical Needs	Clinical Tasks	6	0.857
6	Critically Evaluating Published Research	Research & Audit	6	0.714
7	Establishing a Relationship with the Patient	Communication & Teamwork	6	0.714
8	Writing Reports of your Research Findings	Research & Audit	6	0.714
9	Planning and Organizing an Individual Patient's Care	Clinical Tasks	6	0.714
10	Giving information to patients and/or Carers	Communication & Teamwork	6	0.714
11	Working as a Member of a Team	Communication & Teamwork	6	0.571
12	Designing a Research Study	Research & Audit	6	0.571
13	Collecting and Collating Relevant Research Information	Research & Audit	6	0.571
14	Appraising your Own Performance	Administrative & Personal	6	0.571
15	Evaluating Patients' Psychological and Social Needs	Clinical Tasks	6	0.571
16	Communicating with Patients Face-to-Face	Communication & Teamwork	6	0.571
17	Statistically Analyzing your own Research Data	Research & Audit	6	0.429
18	Making do with Limited Resources	Administrative & Personal	6	0.429
19	Using Technical Equipment, including Computers	Administrative & Personal	6	0.429
20	Undertaking Administrative Activities	Administrative & Personal	6	0.429
21	Undertaking Health Promotion Activities	Administrative & Personal	6	0.429
22	Organizing your own Time Effectively	Administrative & Personal	6	0.429
23	Treating Patients	Clinical Tasks	6	0.429
24	Personally coping with Change in the Health Service	Administrative & Personal	6	0.429
25	Providing Feedback to Colleagues	Communication & Teamwork	6	0.429
26	Showing Colleagues and/or Students how to do Things	Communication & Teamwork	5	0.571
27	Accessing Research Resources	Research & Audit	5	0.571
28	Introducing New Ideas at Work	Communication & Teamwork	5	0.571
29	Applying Research Results to your own Practice	Research & Audit	4	0.286
30	Doing Paperwork and/or Routine Data Inputting	Administrative & Personal	4	0.286

Table 4.4: Ranking Question B Tasks by 5-10 Years of Experience

Rank	Task	Category	Modal Class	p_mod
1	Treating Patients	Clinical Tasks	7	0.667
2	Communicating with Patients Face-to-Face	Communication & Teamwork	7	0.667
3	Getting on with your Colleagues	Communication & Teamwork	6	0.611
4	Planning and Organizing an Individual Patient's Care	Clinical Tasks	6	0.556
5	Working as a Member of a Team	Communication & Teamwork	6	0.500
6	Establishing a Relationship with the Patient	Communication & Teamwork	6	0.500
7	Using Technical Equipment, such as Computers	Administrative & Personal	6	0.500
8	Organizing your own Time Effectively	Administrative & Personal	6	0.500
9	Assessing Patients' Clinical Needs	Clinical Tasks	6	0.500
10	Showing Colleagues and/or Students how to do Things	Communication & Teamwork	6	0.444
11	Giving Information to Patients and/or Carers	Communication & Teamwork	6	0.444
12	Undertaking Administrative Activities	Administrative & Personal	6	0.389
13	Introducing New Ideas at Work	Communication & Teamwork	6	0.389
14	Identifying viable Research Topics	Research & Audit	5	0.611
15	Making do with Limited Resources	Administrative & Personal	5	0.556
16	Doing Paperwork and/or Data Inputting	Administrative & Personal	5	0.500
17	Personally coping with Change in Health Service	Administrative & Personal	5	0.500
18	Evaluating Patients' Psychosocial Needs	Clinical Tasks	5	0.500
19	Accessing Relevant Literature for your Clinical Work	Research & Audit	5	0.444
20	Writing Reports of your Research Studies	Research & Audit	5	0.444
21	Applying Research results to your own Practice	Research & Audit	5	0.444
22	Designing a Research Study	Research & Audit	5	0.389
23	Appraising your own Performance	Administrative & Personal	5	0.389
24	Providing Feedback to Colleagues	Communication & Teamwork	5	0.389
25	Collecting and Collating Relevant Research Information	Research & Audit	5	0.333
26	Interpreting your Own Research Findings	Research & Audit	5	0.333
27	Accessing Research Resources	Research & Audit	5	0.333
28	Critically Evaluating Published Research	Research & Audit	4	0.333
29	Undertaking Health Promotion Activities	Administrative & Personal	4	0.278
30	Statistically Analyzing your own Research Data	Research & Audit	2	0.278

Table 4.5: Ranking Question B Tasks by >10 Years of Experience

Rank	Task	Category	Modal Class	p_mod
1	Getting on with your Colleagues	Communication & Teamwork	7	0.667
2	Treating Patients	Clinical Tasks	7	0.667
3	Planning and Organizing an Individual Patient's Care	Clinical Tasks	6	1.000
4	Accessing Relevant Literature for your Clinical Work	Research & Audit	6	0.667
5	Establishing a Relationship with the Patient	Communication & Teamwork	6	0.667
6	Doing Paperwork and/or Data Inputting	Administrative & Personal	6	0.667
7	Using Technical Equipment, including Computers	Administrative & Personal	6	0.667
8	Undertaking Health Promotion Activities	Administrative & Personal	5	1.000
9	Making do with Limited Resources	Administrative & Personal	5	0.667
10	Assessing Patient's Clinical Needs	Clinical Tasks	5	0.667
11	Providing Feedback to Colleagues	Communication & Teamwork	5	0.667
12	Working as a Member of a Team	Communication & Teamwork	5	0.333
13	Appraising your own Performance	Administrative & Personal	5	0.333
14	Communicating with Patients Face-to-Face	Communication & Teamwork	5	0.333
15	Accessing Research Resources	Research & Audit	4	1.000
16	Identifying viable Research Topics	Research & Audit	4	0.667
17	Undertaking Administrative Activities	Administrative & Personal	4	0.667
18	Organizing your own time Effectively	Administrative & Personal	4	0.333
19	Personally coping with Changes in the Health Service	Administrative & Personal	4	0.333
20	Evaluating Patients' Psychological and Social Needs	Clinical Tasks	4	0.333
21	Giving information to patients and/or Carers	Communication & Teamwork	4	0.333
22	Designing a Research Study	Research & Audit	3	0.667
23	Collecting and Collating Relevant Research Information	Research & Audit	3	0.333
24	Interpreting your own Research Findings	Research & Audit	2	0.667
25	Writing Reports of your Research Studies	Research & Audit	2	0.667
26	Showing Colleagues and/or Students how to do Things	Communication & Teamwork	2	0.333
27	Statistically analyzing your own Research Data	Research & Audit	2	0.333
28	Applying Research Results to your own Practice	Research & Audit	2	0.333
29	Critically evaluating Published Research	Research & Audit	1	0.333
30	Introducing new Ideas at Work	Communication & Teamwork	1	0.333

Radiographers below 5 years of experience felt more confident when performing tasks involving *"Getting on with your Colleagues", "Identifying Viable Research Topics"* and *"Accessing Relevant Literature to your Clinical Work"*, while they felt less confident performing tasks involving *"Applying Research Results to your own Practice", "Doing Paperwork and/or routine Data Inputting"* and *"Introducing New Ideas at Work"*. Radiographers between 5-10 years of experience felt more confident performing tasks involving *"Treating Patients", "Communicating with Patients Face-to-Face"* and *"Getting on with your Colleagues"*, while they felt less confident performing tasks involving *"Statistically Analysing your Own Research Data", "Undertaking Health Promotion Activities"* and *"Critically Evaluating Published Research"*. Finally, Radiographers above 10 years of experience felt more confident performing tasks involving *"Getting on with your Colleagues", "Treating Patients"* and *"Planning and Organizing an Individual Patient's Care"*, while they felt less confident performing tasks involving *"Introducing New Ideas at Work", "Critically Evaluating Published Research"* and *"Applying Research Results to your own Practice"*.

4.2.5 Question C (Please give a rating stating how important you consider training courses to be in improving the performance of this same activity)

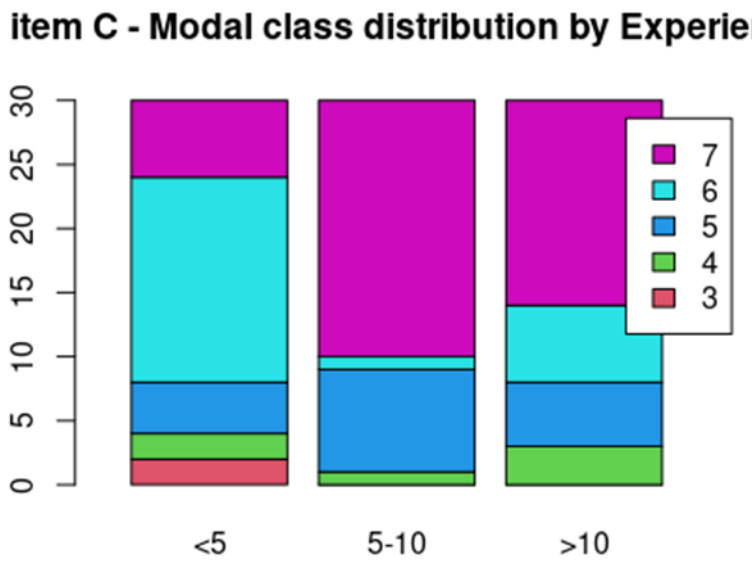

Chart 4.4 Question C Modal Class Distribution by Experience

The bar-plot chart which shows the modal class distribution among radiographers by their level of experience depicts a scenario wherein all the participants believe that the majority of tasks should be improved by training courses. However, it seems slightly less so for the least experienced radiographers who put slightly less weight on training courses in terms of improving task performance (Kruskal-Wallis p-value = 0.00648). Table 4.6 provides a ranking of the tasks which radiographers believe would improve through training courses.

Table 4.6: Ranking Question C

Rank	Task	Category	Modal Class	p_mod
1	Treating Patients	Clinical Task	7	0.679
2	Assessing Patients' Clinical Needs	Clinical Task	7	0.643
3	Planning and Organizing an Individual Patient's Care	Clinical Task	7	0.571
4	Evaluating Patients' Psychosocial and Social Needs	Clinical Task	7	0.571
5	Using Technical Equipment, including Computers	Administrative & Personal	7	0.536
6	Organizing your own time Efficiently	Administrative& Personal	7	0.536
7	Appraising your Own Performance	Administrative & Personal	7	0.500
8	Giving information to patients and/or Carers	Communication & Teamwork	7	0.500
9	Personally, coping with change in Health Service	Administrative & Personal	7	0.464
10	Applying Research Results to Your Own Practice	Research and Audit	7	0.429
11	Communicating with Patients Face-to-Face	Communication & Teamwork	7	0.429
12	Accessing Relevant Literature for Your Clinical Work	Research & Audit	7	0.357
13	Critically Evaluating Published Research	Research & Audit	7	0.357
14	Statistically Analyzing Your Own Research Data	Research & Audit	7	0.357
15	Collecting and Collating relevant Research Information	Research & Audit	7	0.321
16	Undertaking Administrative Activities	Administrative & Personal	7	0.321
17	Introducing New Ideas at Work	Communication & Teamwork	7	0.286
18	Designing a Research Study	Research & Audit	6	0.393
19	Showing Colleagues and/or Students how to do things	Communication & Teamwork	6	0.357
20	Identifying Viable Research Topics	Research & Audit	6	0.357
21	Interpreting your own Research Findings	Research & Audit	6	0.357
22	Writing Reports of your Research Studies	Research & Audit	6	0.357
23	Accessing Research Resources	Research & Audit	6	0.357
24	Establishing a Relationship with Patients	Communication & Teamwork	6	0.250
25	Providing Feedback to Colleagues	Communication & Teamwork	6	0.250
26	Undertaking Health Promotion Activities	Administrative & Personal	5	0.357
27	Working as a Member of a Team	Communication & Teamwork	5	0.321
28	Doing Paperwork and/or Routing Data Inputting	Administrative & Personal	5	0.321
29	Getting on with your Colleagues	Communication & Teamwork	5	0.214
30	Making do with Limited Resources	Administrative & Personal	4	0.286

4.2.6 Question D (Please give a rating stating how important you consider your organisation's input in improving the performance of this activity).

The final question of Phase 1 asked participants to give a rating about their perception of the organisation's input in improving the performance of the listed activities. The results are similar to Question C, however with a higher intensity. The percentage of answers equal to 7 here is 70% (Chart 4.5). There are no relevant differences between the scores of radiographers categorized by experience (Kruskal Wallis p-value = 0.5943). The results seem to depict a high demand for organizational improvements. Table 4.7 provides a ranking of the tasks most likely to improve via the organizational efforts.

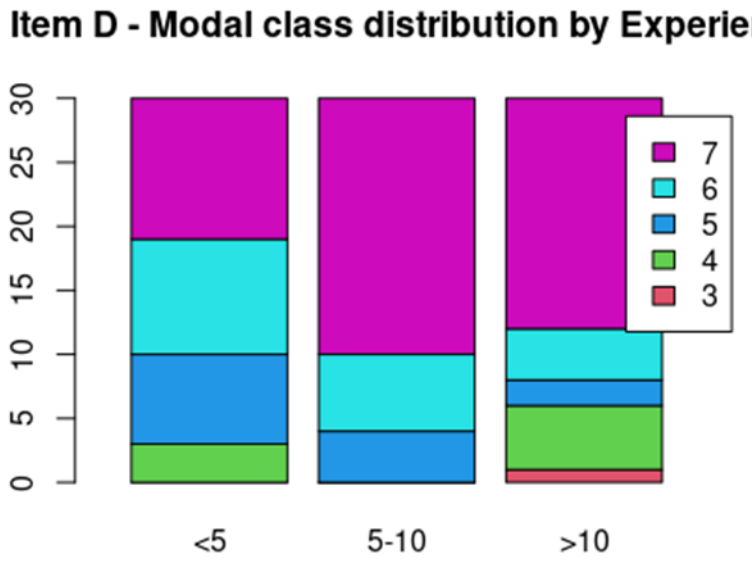

Chart 4.5 Question D Modal Class Distribution by Experience

Table 4.7: Ranking Question D

Rank	Task	Category	Modal Class	p_mod
1	Treating Patients	Clinical Tasks	7	0.786
2	Planning and Organizing an Individual Patient's Care	Clinical Tasks	7	0.679
3	Assessing Patients' Clinical Needs	Clinical Tasks	7	0.679
4	Evaluating Patients' Psychosocial and Social Needs	Clinical Tasks	7	0.643
5	Applying Research Results to Your Own Practice	Research & Audit	7	0.571
6	Using Technical Equipment, including Computers	Administrative & Personal	7	0.571
7	Appraising your own Performance	Administrative & Personal	7	0.571
8	Working as a Member of a Team	Communication & Teamwork	7	0.536
9	Giving Information to Patients and/or Carers	Communication & Teamwork	7	0.536
10	Accessing Research Resources	Research & Audit	7	0.500
11	Personally coping with changes in the Health Service	Administrative & Personal	7	0.500
12	Getting on with your Colleagues	Communication & Teamwork	7	0.464
13	Designing a Research Study	Research & Audit	7	0.464
14	Making do with Limited Resources	Administrative & Personal	7	0.464
15	Organizing your own time Effectively	Administrative & Personal	7	0.464
16	Establishing a Relationship with Patients	Communication & Teamwork	7	0.429
17	Accessing Relevant Literature for Your Clinical Work	Research & Audit	7	0.393
18	Undertaking Administrative Activities	Administrative & Personal	7	0.393
19	Communicating with Patients Face-to-Face	Communication & Teamwork	7	0.393
20	Identifying Viable Research Topics	Research & Audit	7	0.357
21	Collecting and Collating Relevant Research Information	Research & Audit	7	0.357
22	Showing Colleagues and/or Students how to do things	Communication & Teamwork	6	0.500
23	Introducing New Ideas at Work	Communication & Teamwork	6	0.464
24	Critically Evaluating Published Research	Research & Audit	6	0.393
25	Undertaking Health Promotion Activities	Administrative & Personal	6	0.393
26	Providing Feedback to Colleagues	Communication & Teamwork	6	0.393
27	Writing Reports of Your Research Studies	Research & Audit	6	0.286
28	Interpreting your own Research Findings	Research & Audit	5	0.393
29	Doing Paperwork and/or Routine Data Inputting	Administrative & Personal	5	0.393
30	Statistically Analyzing Your Own Research Data	Research & Audit	5	0.321

4.3 Phase 2 – Thematic Analysis

The second phase of the study required the participants to specify any areas of the job in which they wished to receive additional training and instruction. The question was open-ended, meaning that the participants were free to list any areas in which they felt would benefit from further training.

A useful qualitative technique for examining questionnaires' open-ended responses is thematic analysis. In order to properly conduct a thematic analysis, the initial step involves thoroughly understanding the data. Secondly, codes should be created to identify key concepts or ideas in the responses. Similar codes should be organised into prospective topics that can be further developed and checked for coherence and applicability. The themes must be identified and given names in order to appropriately reflect the data in the final stage. This procedure offers a controlled method to find patterns, meanings, and insights within the textual data, enabling researchers to draw out rich and nuanced understandings from open-ended questionnaire replies, as demonstrated by Nowell et al. (2017). For this study's data, the responses were colour coded according to relating and repeating themes that appeared as the analysis was conducted. Fifteen themes were identified and were listed in order of how frequently they were mentioned in the responses.

4.3.1 Theme 1: Management of Radiotherapy Side-Effects and Nutrition

Management of Radiotherapy Side Effects and Nurition was one of the most repeated responses (17/28 responses). The participants outlined the need to receive training that is

up-to-date and evidence based, for both acute and late side-effects which patients experience when they receive Radiotherapy treatment.

"Research gaps with respect to long-term RT side effects. Is our advice helping? What happens with our patients?" (P02)

"Training on pharmacological management of disease symptoms and treatment side effects, contraindications, medicine side effects and interactions with other medications" (P13)

"Training on nutritional management of disease symptoms" (P13)

"Long term management of late side effects" (P16)

"Training in updated, evidence-based treatment side effect management" (R28)

Nutrition was also frequently mentioned in par with this response, which is expected, particularly as some patients for example patients receiving radiotherapy treatment for head and neck cancers tend to experience side-effects which impede appropriate nutrition, which may lead to significant weight loss.

4.3.2 Theme 2: Psychosocial Needs

The second most repeated response (17/28) was Psychosocial needs of both patients and staff. Some responses highlighted the importance of staff to be trained psychologically in order to face the daily emotional struggles which are second nature to the role.

"Psychological assessment for staff – learning to cope with the nature of our job" (P02)

"Better understanding of the psychosocial needs of our patients and how to provide them with the necessary care." (P02)

"Coping mechanism to maintain a good healthy working environment" (P08)

"How to take care of our (the staff's) personal psychological health due to the cases that we face daily" (P12)

"How to be empathic with the patients yet still have enough desensitisation" (P12)

"Training on psychosocial support + spiritual support of patients, relatives, and fellow colleagues + referral pathway to appropriate psychosocial support including the establishment and use of (self and interpersonal) assessment questionnaires + use of workshops and focus groups" (P13)

Participant 12 highlighted the need to be empathic with the patients and yet still possess a level of desensitasation that is enough to allow staff to go on with their daily lives outside their role, while participant 13 mentioned the need of an appropriate referral pathway for patients requiring psychological support in addition to training on using assessment questionnaire as well as workshop and focus groups.

4.3.3 Theme 3: Research, Auditing and Quality Assurance

Participants allude to the importance of training in research, quality assurance and performing audits. Some participants also mentioned training on how to create standard operating procedures (SOPs) and writing and updating protocols and incident reports.

"Research and audits" (P04)

"Writing and updating protocols" (P06)

"Regulatory compliance and ethics" (P07)

"Quality control and quality assurance" (P09)

"Training, establishing pathways and SOPs/guidelines on machine breakdowns, clearly outlining roles and what happens (establishing contingency plan to be followed rather than relying on staff to resolve crisis and improvise)." (P13)

"Incident Reporting" (P19)

"Courses to support staff in conduction departmental research including research methodology, methods, analysis and presentation of results" (P27)

Additionally, participant 13 highlights the importance of guidance with a written contigency plan for cases when machine breakdowns occur, for staff to be aware of the procedure to follow instead of improvising when the issue occurs.

4.3.4 Theme 4: Advanced Radiotherapy Techniques

Participants believed that training should be provided on advance radiotherapy techniques at the Radiotherapy Department, particularly on techniques which are being implemented and on techniques which are yet to be implemented.

"Ultrasound training for bladder filling assessment" (P02)

"Carrying out and implementing new techniques" (P08)

"Treating using new techniques (introduced in the department in recent years) ex. DIBH, 4D CT scanning etc" (P17)

"Treatment delivery and techniques of new developments/newly commissioned equipment/software" (P18)

"SBRT" (P22)

"Training for the use of new equipment and treatment techniques e.g. MR linac, brachytherapy" (P27)

Some participants mentioned specific techniques including Ultrasound, Deep Inspiration Breath Hold (DIBH), Stereotactic Body Radiotherapy (SBRT), Brachytherapy, 4D Scanning as well as training on new radiotherapy treatment machines such as the MR Linac.

4.3.5: Theme 5: Radiotherapy Planning and Contouring of Organs at Risk

Participants claimed that they would benefit with training on radiotherapy planning and contouring of specific organs at risk.

"Organs at risk contouring/feedback/training of new OARs" (P02)

"Treatment planning (complex)" (P07)

"Dosimetry training" (P09)

"Further guidance on how to perform secondary pre-planning checks on breasts with SCF plans – ensure updated protocols and more hands-on training" (P17)

"AI integration in Radiotherapy" (P23, P24)

"Training in details cross-sectional anatomy to aid contouring" (P28)

Participant 17 mentioned radiotherapy breast planning with treatment to the supraclavicular fossa (SCF) with more hands-on training. Participants 23 and 24 mentioned artificial intelligence and its interesting role in contouring for radiotherapy. Participant 28 mentioned the need for training on cross-sectional anatomy to bring more confidence during contouring.

4.3.6 Theme 6: Chemotherapy and other Pharmacology used Concomitantly with Radiotherapy

Participants highlighted the importance of training on chemotherapy, hormone therapy, immunotherapy or other pharmacological treatments that are delivered concomitantly with radiotherapy.

"Pharmacology/chemotherapy/drugs prescribed in conjunction with RT" (P02)

"Chemotherapy and other RT complementary treatments" (P07)

"Training on other cancer treatments and their side-effects" (P13)

"Training in alternate treatments (chemo, hormone, immunotherapy) side effects to be able to treat patients in a more holistic way" (P28)

Participant 28 mentioned the importance of treating patients holistically, and thus being aware and up-to-date about the patient's whole treatment, not simply limited to Radiotherapy.

4.3.7 Theme 7: Management and Administration

Participants also mentioned the need for training on management and administrative activities, including project management, leadership and managing resources, staff and the environment.

"Project management" (P04)

"Management/administrative work" (P14)

"Change management" (P19)

"Intercultural management" (P19)

"Leadership – management resources and people" (P19)

4.3.8 Theme 8: Multidisciplinary Team

Participants mentioned the importance of being aware and being part of the multidisciplinary teams and interprofessional collaboration among the various healthcare professionals the patient will meet as part of their oncological treatment.

"Interdisciplinary teamwork" (P07)

"Teamwork, collaboration and working in multi/trans-disciplinary team (be aware of other professions and their service within the oncology centre)" (P18)

"MDT approaches and other HP work practice awareness" (P24)

4.3.9 Theme 9: Communication Skills

Participants remarked about receiving further training on communication skills with both patients and staff. Participant 17 puts focus on the patient, providing as examples uncoopertive or aggressive patients and paediatrics.

"Training courses to help build communication skills with colleagues and patients" (P02)

"Training on how to better improve communication skills (ex how to deal with uncooperative, aggressive patients or paediatrics)" (P17)

"Effective communication skills" (P18)

"Constructive and critical feedback" (P18)

Participant 18 mentioned constructive and critical feedback with colleagues and other members of staff.

4.3.10 Theme 10: CT Simulation

Last but not least, CT Simulation in Radiotherapy was regularly mentioned among participant responses. Contrast administration through intra-venous (IV) and porta cath were specifically mentioned, including treatment set-up and off-protocol approaches in the cases of upper and lower limb radiotherapy.

"CT (canon) + contrast administration" (P01)

"Treatment setup (from planning CT)" (P15)

"Further training on the use of PICC lines, porta cath, etc. and how and when these can be used for contrast administration during CT simulation" (P17)

"Different immobilization and set-up, different brands" (P23)

"Treatment approaches to U/L limbs in radiotherapy" (P24)

4.4 Additional Remarks

Table 4.8 illustrates the Themes as categorized into the four main categories i.e., Clinical Tasks, Communication and Teamwork, Research and Audit and Administrative and Personal. This analysis indicated that RTTs want to receive further training mostly on Clinical Tasks.

Table 4.8: Summary of Categorized Themes

Clinical Tasks	Theme 1: Management of Radiotherapy Side-Effects and Nutrition Theme 2: Psychosocial Needs Theme 4: Advanced Radiotherapy Techniques Theme 5: Radiotherapy Planning and Contouring of Organs at Risk Theme 6: Chemotherapy and other Pharmacology used Concomitantly with Radiotherapy Theme 10: CT Simulation
Communication & Teamwork	Theme 8: Multidisciplinary Team Theme 9: Communication Skills
Research & Audit	Theme 3: Research, Auditing and Quality Assurance
Administrative & Personal	Theme 7: Management and Administration

A number of singular remarks were also mentioned by participants which include, taking clinical decisions when consultants are not present, complementary therapies, basic life support, performance appraisals, 3D printing, mouldroom training, Mosaiq training and manual handling.

"The organisation should also aim to provide free refresher courses in basic life support/first aid" (P17)

"Manual handling of patients, never had a refresher course after graduating" (P28)

4.5 Conclusion

In conclusion, the data analysis methods have produced significant findings and insightful information that help to comprehend the underlying trends and patterns in the dataset better, as well as put forward valuable recommendations. The data was carefully explored, cleaned, and analysed in order to extract pertinent information and produce solid conclusions.

Chapter 5 - Discussion

Chapter 5 – Discussion

5.1. Introduction

This pivotal chapter provides an in-depth discussion of the results presented in the preceding chapter. The aim is to examine the significance, impact, and applicability of the findings by drawing comparison to existing literature.

5.2. Clinical Tasks

According to the findings, clinical tasks were deemed among the most important tasks. For the closed questions of the questionnaire, these tasks included *treating patients, assessing patient's clinical needs, planning and organising an individual patient's care and evaluating patient's psychosocial and social needs*. These tasks ranked 1st, 4th, 5th and 10th as most important tasks respectively. 'Treating patients' ranked first among the majority of RTTs. For RTTs treating patients entails administering radiotherapy using the various machines at the Radiotherapy department. This is supported by literature. Marshall et al. (2008) in a study on Radiographers observed that topics regarding clinical modalities were preferred among participants, while a more recent study including RTTs in Singapore also noted clinical as the most important area of interest in training (Mohamed Afif et al., 2021). RTTs with less than 5 years of experience did not feel most confident in treating patients in comparison to the more experienced RTTs (5-10 years and >10 years) who felt less confident in evaluating a patient's psychosocial and social needs. The latter is supported by Azzopardi et al. (2022), who conducted a study on the provision of psychosocial support to cancer patients. RTTs felt less confident in providing counsel on matters related to mental health, interpersonal relationships, family dynamics,

financial concerns and spirituality and religion. The findings of this study also noted how RTTs wish to be trained on *their own* psychosocial skills pertaining to the nature of the job. A particular participant also noted the importance of a level of desensitisation in coping with the role, as establishing relationships with patients could affect their coping mechanism during their job and outside work.

Clinical tasks were also very dominant in the open-ended section of the questionnaire. One of the popular topics among RTTs was Advanced Radiotherapy Techniques. This included techniques recently introduced into the Radiotherapy Department as well as techniques that are yet to be implemented. This resonates with the literature. A study by Hazel Pennington (2011) on staff educational needs in Radiotherapy features 'technique lectures' and 'oncology updates' as desirable by all grades. Radiotherapy Planning and Contouring of Organs at Risk which was also frequently mentioned in the findings was also a preferred topic in the study by Pennington. More recently, studies by Rashid et al. (2021) and Joyce et al. (2023) on adaptive radiotherapy for RTTs also noted the importance of Radiotherapy Planning and CT contouring as training needs.

Management of Radiotherapy Side Effects and Nutrition was also frequently noted in the findings. Significant side effects of radiotherapy treatments can have a detrimental impact on cancer survivors' quality of life. RTTs should thoroughly evaluate any RT related symptoms and provide appropriate management (Dilalla et al., 2020). This is also supported by literature, Pallin et al. (2020) concluded that RTTs need training to give guidance on enhancing health behaviours to persons living with and beyond cancer.

Chemotherapy and other pharmacology used concomitantly with RT was also well noted in the findings. RTTs, despite not being directly linked with chemotherapy and other pharmacology, still wished to receive training on the drugs which interact with RT in order to administer effective treatment holistically.

CT Simulation was repeatedly observed in the findings, particularly on the administration of contrast. This is in agreement with the findings by Pennington (2011), who noted that more cannulation trained staff were required in order to increase the service of IV contrast simulation scans.

Finally, RTTs believe that both training courses and the input of the organisation is important in improving the performance of clinical tasks, favouring the input of the organisation, with all clinical tasks ranking at the top of the list.

5.3. Communication and Teamwork

Communication and teamwork tasks also ranked very high among RTTs as regards to importance of their training needs. This was also noted in the study by Mohamed Afif et al. (2021). 'Working as a member of a team', 'Communicating with patients face-to-face', 'Giving information to the patient and carers' and 'Establishing a relationship with the patient' were all among the top ten most important tasks perceived by RTTs in this study. Similarly, a study by Halkett et al. (2010) demonstrated that RTTs perceive themselves as front-liners in delivering information to patients. Because RT is delivered daily over a period of weeks, RTTs are in contact with patients every day. This places them in a unique

position to understand and alleviate patients' demands and concerns, particularly in regards to expectations and side effects of treatment. Literature demonstrates that training RTTs in communication and interpersonal skills has a positive impact on patients' understanding of RT and treatment satisfaction, resulting in a marked decrease in emotions of anxiety, dread and discomfort (Mattarozzi et al., 2019).

Additionally, RTTs also highlighted the importance of multidisciplinary teams and interprofessional collaboration among different professions. This was also cited in the study by Zereshkian, A. et al. (2019). One method suggested to university programmes was to provide patient cases that included the contributions of various disciplines. The need of having a wide range of professionals from diverse specialisations present, especially those with knowledge of interprofessional collaboration to promote learning, was deemed paramount (Zereshkian et al., 2019). A study by Lee et al. (2010) also mentioned team building skills as CPD topics. Moreover, a study by Thingnes & Lewis (2011) conducted on Medical Imaging Radiographers suggested study groups with interdisciplinary meeting places, as they were deemed as "important arenas for feedback and learning".

It is also important to note that many RTTs from all experience categories did not feel very confident in the tasks involving 'Providing feedback to colleagues', 'Showing colleagues/students how to do things' and 'Introducing new ideas at work'. This merits communication training among the team of RTTs. This profession relies on outstanding teamwork by virtue of the fact that RT should be delivered by a team of RTTs. A good

level of communication among the working team is therefore important for the safe and efficient administration of RT treatment (Udowicz et al., 2013).

In this category, RTTs deemed both training courses and the organisation as important for improving their performance, favouring the organisation.

5.4. Administrative and Personal

The Administrative and personal task category was among the middle ranking tasks in terms of importance with regards to training needs as perceived by the RTTs in this study. The highest-ranking task in this category was 'Using Technical Equipment including Computers' and this is in line with the very technical aspect of the profession (using various different Radiotherapy technologies, including machines and software). In the open-ended section RTTs mentioned leadership, project management, change management and intercultural management. Marshall et al. (2008) in a survey on CPD requirements noted that UK participants outlined management as a topic of preference while EU participants gave less importance to management. In the study by Mohamed Afif et al. (2021), however, participants outlined leadership as a topic of preference. RTTs must take on administrative and leadership positions through supervisory duties, project management, guiding new initiatives, promoting improvement, and the effective use of resources. RTTs also manage workload in order to ensure safe practice (Couto et al., 2020). In modern healthcare, change is being continuously fuelled. This is due to the requirement to increase quality and safety, the requirement to lower costs, the requirement to deliver patient-centred care, and the continual implementation of new technologies (Chamunyonga et al., 2020). These are exacerbated by issues the workforce is facing, such as employee shortages, insufficient or inefficient resource utilisation, and pressures

connected to workload and burnout. RTTs are not exempt from these difficulties particularly due to the continuous advances in technology and techniques (Chamunyonga et al., 2020). All these changes in practice merit a greater level of accountability and responsibility, with RTTs experiencing greater decision-making practices, this therefore mandates that RTTs possess an awareness of leadership concepts in clinical practice, thus requiring a level of leadership training (Chamunyonga et al., 2020).

The least experienced RTTs appeared to be less confident in this task category in comparison to the more experienced RTTs. It was also noted that RTTs seem to agree that both training courses and the organisation's input for training on matters regarding administrative and personal tasks is important, however they seem to favour the organisation's input.

5.5. Research and Audit

The Research and audit task category were given medium to low importance in regards to training needs perceived by RTTs, particularly the tasks pertaining to research, similar to the study by Mohamed Afif et al. (2021) who justified this by stating that only a few radiographers were involved in research. This is the same scenario locally, as to date there are no RTTs participating or involved in research. Despite the rapid technological developments in Radiotherapy, concerns have been raised about the underutilization and lack of priority as a research domain in comparison to other cancer treatment modalities (Aggarwal et al., 2018). A global analysis on Radiotherapy Research by Aggarwal et al. (2018) noted that research in Radiotherapy is rising globally, however it is still lagging behind other areas of cancer management. The study also noted that there was a significant variation among countries' individual commitment to different research fields,

and only 5.1% of the overall research analysed was directly linked to clinical trials. International collaboration and increased funding are necessary for radiation treatment research in low- and middle-income countries (Aggarwal et al., 2018).

RTTs in this study have mentioned more frequently the importance of quality assurance and auditing in the open-ended section of the study. Particularly the importance of learning how to write SOPs (standard operating procedures), protocols and incident reports. This is justified by the fact that with the current advances in technologies and techniques, clinical protocols and ethical standards are changing, which brings new opportunities to RTTs to be involved in the documentation of protocols to improve accuracy, safety, and the standard of care (Chamunyonga et al., 2020). Despite this task category being considered as less important than other categories by RTTs, the more experienced RTTs felt less confident in undertaking research activities compared to the RTTs with less experience. This could be due to the lack of involvement in research after the undergraduate degree was obtained. RTTs also believe this task category overall could be improved through training courses and the organisation's input, however they favour the organisation's input to improve these tasks.

5.6. Additional Remarks

It could be noted from the findings that as the level of experience increases, overall confidence decreases. This phenomenon may be explained by Allan and Moffett's Conscious Competence Cycle Matrix discussed in Chapter 2. As the individual gains more experience, the knowledge and skills increase, becoming second nature, reaching level 4 of the cycle matrix 'unconscious competence'. This may explain why the more

experienced RTTs feel ‘less confident’ as there is an awareness of the need for continuous learning and maintaining skills and competencies, particularly in such a dynamic profession which requires constantly updating skill sets and gaining new competencies with the introduction of new RT techniques and technologies.

Finally, it could also be noted that the two methodologies converged in harmony, confirming the reliability of the findings. The qualitative and quantitative results provided more thorough and sensitive conclusions, particularly as the qualitative responses were able to reinforce the quantitative results, ensuring that the research findings were not only statistically viable but also firmly based on the experiences and perspectives of the study participants in the real world.

5.7. Conclusion

In conclusion, this chapter enabled a thorough discussion of the research findings, highlighting the major themes and insights that emerged from this study. It served to bridge the gap between the research conducted and its significance, laying the groundwork for the upcoming chapters that will explore recommendations, limitations, and possible directions for future studies.

Chapter 6 – Recommendations & Conclusions

Chapter 6 – Recommendations and Conclusions

6.1. Introduction

This research journey concludes in this final chapter by summarising the key findings and revelations made during the course of this dissertation. In the pages that follow, wider ramifications and possible directions for further research will be explored, while recommendations for a tailored CPD programme for RTTs will be proposed.

6.2. Summary of Key Findings

All RTTs seem to be in agreement on which tasks they perceive to be the most important for their training needs. Clinical tasks were considered as the most important tasks, followed by communication and teamwork, administrative and personal, and research and audit. The top ten general and specific tasks perceived to be the most important by RTTs are summarised in tables 6.1 and 6.2 below.

Table 6.1. Top 10 Most Important General Tasks

Rank	Task	Category
1	Treating Patients	Clinical Task
2	Working as a Member of a Team	Communication and Teamwork
3	Communicating with Patients Face-to-Face	Communication and Teamwork
4	Assessing Patient's Clinical Needs	Clinical Task
5	Planning and organizing an individual Patient's Care	Clinical Task
6	Giving information to the Patient and/or Carers	Communication and Teamwork

7	Establishing a Relationship with the Patient	Communication and Teamwork
8	Using Technical Equipment including Computers	Administrative and Personal
9	Applying Research Results to Your Own Practice	Research and Audit
10	Evaluating Patients' Psychosocial and Social Needs	Clinical Task

Table 6.2. Top Ten Most Important Specific Tasks

Rank	**Task**	**Category**
1	Management of Radiotherapy Side-Effects and Nutrition	Clinical Task
2	Psychosocial Needs	Clinical Task
3	Research, Auditing and Quality Assurance	Research and Audit
4	Advanced Radiotherapy Techniques	Clinical Task
5	Radiotherapy Planning and Contouring of Organs at Risk	Clinical Task
6	Chemotherapy and other Pharmacology used Concomitantly with Radiotherapy	Clinical Task
7	Management and Administration	Administrative and Personal
8	Multidisciplinary Teams	Communication and Teamwork
9	Communication Skills	Communication and Teamwork
10	CT Simulation	Clinical Task

Moreover, training courses and the organization are both perceived as important to achieve training and enhance workplace performance, with RTTs giving more value to the organisation, seemingly seeking for organization improvements.

The thematic analysis performed strengthened the responses from the quantitative section as RTTs harmoniously agreed that Clinical Tasks are the at the forefront for the most important area of training needs.

Finally, the objectives for this study were reached through this training needs analysis as the current standard of CPD was identified, while present and future needs of the profession as regards to CPD were recognized, achieving a solid basis to implement a CPD training programme tailored towards RTTs. This in turn will result in CPD activities related to the profession's needs, thus ensuring a safe, competent and up-to-date workforce.

6.3. Research Critique

Recognising research constraints is an essential part of conducting rigorous and diligent research. In this study, the cross-sectional design could risk missing evolving or dynamic demands that can vary over time because it only captures the organisation 's training needs at a single moment in time. Moreover, RTTs may have answered to accommodate to the study's objectives, and thus distorting true study results. This is known as acquiescence response bias - the tendency to complete questionnaires regardless of the nature or purpose of the questions (Costello and Roodenburg, 2015). These restrictions should be taken into account when planning larger, longer-term studies in the future.

6.4. Future Directions

The paramount objective of this research was to use the findings from this TNA to facilitate a priority list to guide the organisation, as well as for the use by CPD organising

committees, such as those of the Society of Medical Radiographers Malta (SRM) so as to cater specifically to the needs of RTTs. This research does not, however, mitigate the logistical challenges of CPD, in particular those related to cost, time, presumed lack of benefit, family constraints, and lack of support in training and professional development (Marshall et al., 2008). It should therefore be considered to pair the results from this study with studies on RTTs preferred methods of CPD delivery.

6.5. CPD Programme for RTTs Recommendations

The table below is a recommendation for a CPD programme, including general and specific activities by task categories. This CPD programme may be delivered over a number of years, followed by a repeated TNA to ensure training needs are kept relevant, reflected future needs of the organization.

Table 6.3. illustrates the recommendations on CPD areas based on the TNA conducted on RTTs.

Recommendations for Continuous Professional Development Programme for Radiation Therapists, 2023.	
Category	**Topics**
Clinical Tasks	1. Advanced Radiotherapy Practice ▪ Deep Inspiration Breath Hold ▪ Stereotactic Body Radiation Therapy ▪ Adaptive Radiotherapy ▪ MR Linac ▪ AI in Radiotherapy 2. Radiotherapy Complex Planning 3. Contouring in Radiotherapy

	4. Psychosocial needs of Radiotherapy Patients and Staff 5. Evidence Based Management of Radiotherapy Side Effects: Acute and Long Term 6. Chemotherapy and other Pharmacology used Concomitantly with Radiotherapy 7. CT Simulation ▪ Patient Positioning ▪ Contrast Administration ▪ 4D Scanning
Communication and Teamwork	1. Communication with Patients ▪ Providing Information to Patients and Carers ▪ How to Approach different types of patients ▪ Establishing a Relationship with the Patient as a Healthcare Provider 2. Communication with Staff ▪ Working as a member of a Team ▪ Multidisciplinary Teams ▪ Providing Feedback ▪ Introducing new ideas
Administrative and Personal	1. Leadership in Radiotherapy 2. Project Management 3. Performance Appraisals 4. Using Technical Equipment
Research and Audit	1. Research in Radiotherapy 2. How to conduct an Audit

	3. Writing Protocols 4. Incident Reporting

6.6. Conclusion

In conclusion, this training needs analysis has revealed insightful information that once used may improve RTTs professional growth and patient care. CPD programmes may be designed to successfully meet these needs by focusing on the areas that this TNA has identified as needing development. By virtue of this proactive approach, RTTs may be kept on track with the most recent developments in their area, thereby potentially ensuring the greatest levels of patient quality satisfaction and safety. With a dedication to continuous learning and skill development, RTTs may be better positioned to deliver high quality patient management in this perpetually evolving professional landscape. This improvement ultimately benefits the patients they serve, as well as the reputation of the healthcare organisation providing the radiotherapy services.

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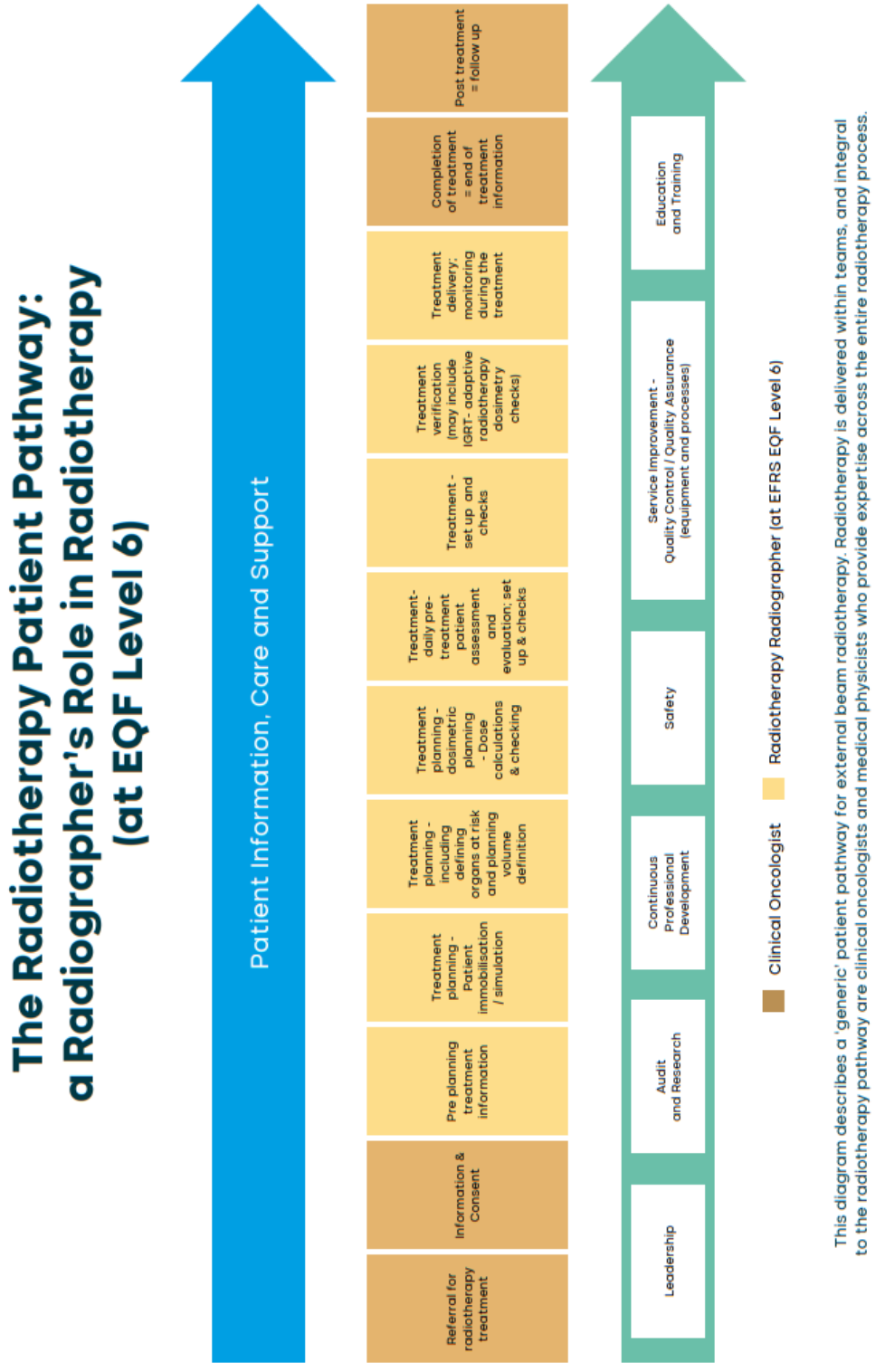
Appendices

Appendix A

The Radiotherapy Patient Pathway: A Radiographer's Role in Radiotherapy



The Radiotherapy Patient Pathway: A Radiographer's Role in Radiotherapy (Available at https://api.efrs.eu/api/assets/posts/200 accessed 26th March 2023)

Appendix B

Pilot Study Feedback Form

UNIVERSITY OF MALTA
L-Università ta' Malta

EXECUTIVE MASTER OF BUSINESS ADMINISTRATION

PILOT STUDY FEEDBACK QUESTIONNAIRE

Thank you very much for taking the time to participate in the pilot study of my research. Your feedback on this questionnaire will assist me in making improvements prior to the main study.

Should you require clarification, please do not hesitate to contact me on ashley.schembri.11@um.edt.mt

1. How long did it take you to complete the questionnaire? _____
2. What is your opinion on the length of the questionnaire? ☐ About Right ☐ Too Short ☐ Too Long
3. What is your opinion on the clarity of the questions? ☐ Poor ☐ Satisfactory ☐ Good ☐ Very Good ☐ Excellent
4. What is your opinion on the structure and format of the questionnaire? ☐ Poor ☐ Satisfactory ☐ Good ☐ Very Good ☐ Excellent
5. Does this questionnaire omit any aspects which you consider to be important to the training needs of Radiotherapy Radiographers? ☐ Yes ☐ No If "Yes" please comment: _____
6. Did you find any difficulties completing the questionnaire? ☐ Yes ☐ No If "Yes" please comment: _____

THANK YOU.

Appendix C

Questionnaire Consent and Research Tool

L-Università ta' Malta

QUESTIONNAIRE CONSENT
ANONYMOUS DATA COLLECTION

Dear Participant,

My name is Ashley Schembri Frascogna and I am reading for a Master's in Business Administration at the University of Malta.

I am currently conducting research that aims to analyze the training needs of Radiation Therapists in regard to continuous professional development (CPD) and to identify which areas of CPD are most beneficial for patient service quality improvement at the Radiotherapy Department. The questionnaire that you have been invited to complete forms part of this study. This will take you approximately fifteen minutes to complete. Any data collected from this survey will be used solely for the purposes of this study. There are no direct benefits or anticipated risks in taking part. Participation is entirely voluntary, i.e., you are free to accept or refuse to participate.

At no point will you be asked to provide your name or any other personal data that may lead to your identification. Furthermore, you may skip over any questions that you do not wish to answer.

Should you have any questions or concerns, you may contact me or my supervisor at the details provided below.

Yours Sincerely,

Ashley Schembri Frascogna
ashley.schembri.11@um.edu.mt

Professor Sandra Buttigieg
sandra.buttigieg@um.edu.mt

DECLARATION BY RESPONDENT: I hereby confirm that I am 18 years of age or older. I am aware that completing and submitting this anonymous questionnaire implies that I am participating voluntarily and with full informed consent on the conditions listed above.

HENNESSY-HICKS ASSESSMENT OF TRAINING NEEDS AND APPROACHES TO PERFORMANCE IMPROVEMENT

Before reading the instructions, please complete the

following:

Job title: _____

Gender: _____

Age: _____

Number of years in the post: _____

INSTRUCTIONS FOR COMPLETION:

This questionnaire comprises four sections that are to do with your training needs.Please answer all the questions as honestly as possible to enable us to compile a complete picture of your training requirements. Each section is prefaced with instructions for completion. Please read and follow these carefully.

SECTION 1: Training needs

In order to perform your job effectively you need relevant skills. Below, you will see a range of skilled activities you undertake in performing your job. Look at each activity and then rate each by writing the appropriate number in the box. The first rating (A) is concerned with how important the activity is to the successful performance of your job; the second rating (B) is concerned with how well you currently perform that activity. However, in order to perform well at work, you also require suitable work circumstances (e.g., other people's approach, compatible work practices, lack of practical constraints, etc.). In other words, your working environment should allow you to exercise your skills appropriately.

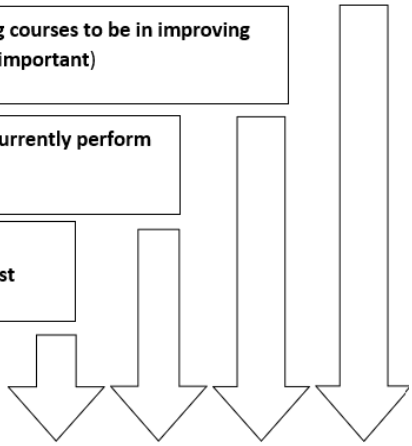
Therefore, the second two ratings (C and D) are concerned with the scope for improving performance either through training alone or through changes in your worksituation.

In column D please give a rating stating **how important you consider the input of your organization in improving the performance of this same activity** (from **1 – least important to 7 – very important**)

In column C please give a rating stating **how important you consider training courses to be in improving the performance of this same activity** (from **1 – least important to 7 – very important**)

In column B please give a rating stating **how well do you consider that you currently perform this same activity** (from **1 – least well to 7 – very well**)

In column A please give a rating stating **how important you consider this particular activity is to the successful performance of your job** (from **1 – least important to 7 – very important**)



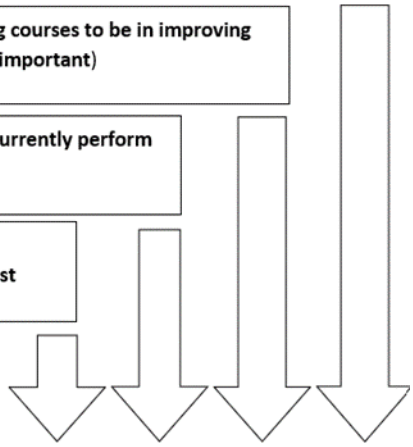
	A	B	C	D
Clinical Tasks				
1. Establishing a relationship with patients				
2. Treating patients				
3. Planning and organizing an individual patient's care				
4. Evaluating patients' psychological and social needs				
5. Assessing patients' clinical needs				
Communication and Teamwork				
6. Communicating with patients face-to-face				
7. Introducing new ideas at work				
8. Giving information to patients and/or carers				
9. Providing feedback to colleagues				
10. Showing colleagues and/or students how to do things				
11. Working as a member of a team				
12. Getting on with your colleagues				

In column D please give a rating stating **how important you consider the input of your organization in improving the performance of this same activity** (from **1 – least important to 7 – very important**)

In column C please give a rating stating **how important you consider training courses to be in improving the performance of this same activity** (from **1 – least important to 7 – very important**)

In column B please give a rating stating **how well do you consider that you currently perform this same activity** (from **1 – least well to 7 – very well**)

In column A please give a rating stating **how important you consider this particular activity is to the successful performance of your job** (from **1 – least important to 7 – very important**)



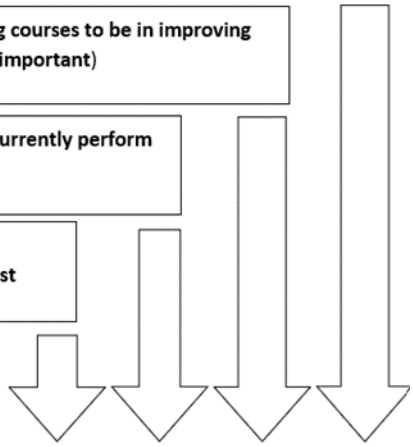
	A	B	C	D
Research and Audit				
13. Designing a research study				
14. Identifying viable research topics				
15. Accessing relevant literature for your clinical work				
16. Critically evaluating published research				
17. Collecting and collating relevant research information				
18. Statistically analyzing your own research data				
19. Interpreting your own research findings				
20. Writing reports of your research studies				
21. Applying research results to your own practice				
22. Accessing research resources (e.g., time, money, information, equipment)				

In column D please give a rating stating **how important you consider the input of your organization in improving the performance of this same activity** (from **1 – least important to 7 – very important**)

In column C please give a rating stating **how important you consider training courses to be in improving the performance of this same activity** (from **1 – least important to 7 – very important**)

In column B please give a rating stating **how well do you consider that you currently perform this same activity** (from **1 – least well to 7 – very well**)

In column A please give a rating stating **how important you consider this particular activity is to the successful performance of your job** (from **1 – least important to 7 – very important**)



	A	B	C	D
Administrative and Personal				
23. Making do with limited resources				
24. Doing paperwork and/or routine data inputting				
25. Using technical equipment, including computers				
26. Undertaking administrative activities				
27. Undertaking health promotion activities				
28. Appraising your own performance				
29. Organizing your own time effectively				
30. Personally coping with change in the health service				

SECTION 2: Specific training needs

Please specify the areas of your job in which you would like to receive further training or instruction. List these in order of importance:

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Thank you for taking the time to fill out this questionnaire.

Appendix D

Data Protection Office Clearance and UREC Approval

Data Protection Clearance Declaration Form

REF: 125/2023

I hereby declare that I will respect the confidentiality and privacy of any personal data or information that I will come across at Mater Dei and will in no circumstance disclose any such information to third parties.

I confirm that information submitted for Data Protection Clearance is correct and that I will abide with conditions issued in same clearance notice.

- This clearance does not cover ethical approval.
- All documents presented to your participants must include UOM's logo.
- This clearance is valid for your report to be included with your dissertation only and not in medical journals or elsewhere since you are not obtaining approval from MDH legal office.
- This clearance is only valid for your questionnaire to be distributed as paper-based and not online.
- This clearance does not allow verbal communications, meaning that verbal consent is not covered.
- This clearance does not allow viewing of medical records nor access to Health Information Systems.
- This clearance doesn't allow patient contact / communication.
- This clearance doesn't allow access to medical records / MDH Health Information Systems.
- Your submitted documentation must remain unchanged.
- What was declared during this clearance process is what you will abide to.
- You must abide with all the articles of the GDPR (EU) 2016 / 679 throughout the data collection process and thereafter.
- You are requested to submit a copy of your findings to this office at the end of your study.
- Please communicate with Ms Cynthia Spiteri to present this clearance email.

I also declare that I am aware of the provisions of the:

General Data Protection Regulation (2016)
(ref: https://idpc.org.mt/en/Pages/gdpr.aspx),
Computer misuse provisions of the Criminal Code
(ref: http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8574),
and, the Professional Secrecy Act
(ref: http://www.justiceservices.gov.mt/DownloadDocument.aspx?app=lom&itemid=8844&l=1)

and that I will abide by all Government and Hospital regulations related to data, information and use of IT Systems and services (ref: http://ictpolicies.gov.mt , http://www.kura.gov.mt).

Gmail

Ashley Schembri Frascogna <ashleysche@gmail.com>

The status of your REDP form (FEMA-2023-00147) has been updated to Endorsed by supervisor

form.urec@um.edu.mt <form.urec@um.edu.mt> Thu, Feb 9, 2023 at 1:12 PM
To: ashley.schembri.11@um.edu.mt

Dear Ashley Schembri Frascogna,

Please note that the status of your REDP form (FEMA-2023-00147) has been set to *Endorsed by supervisor*.

Your form has now been received by F/REC. As you flagged no issues in your self-assessment and submitted for records, you may proceed with your research (your form will be retained for audit purposes but it will not be reviewed by the F/REC).

You can keep track of your applications by visiting: https://www.um.edu.mt/research/ethics/redp-form/frontEnd/.

This email has been automatically generated by URECA. Please do not reply. If you wish to communicate with your F/REC please use the respective email address.