Examining feasibility of advanced practice radiation therapy roles within the Singapore healthcare arena: A joint UK-Singapore study.

Robin Jhagra[1] | Ricardo Khine[2] | Melanie Clarkson[3] | Tan Chek Wee[4] | Wee Yao Koh[5] | Li Li Goh[6] | Carol Jarvis[7] | Julie Woodley[8]

Abstract

Rationale: Advanced clinical practice in UK healthcare has matured over recent years, promoting multi-professional working and flexibility in patient care, crucial amidst increasing clinician shortages. In radiation oncology, the advanced practitioner radiographer role has been pivotal. Observing a rising necessity for similar roles, officials from the National University Health System, Singapore conducted a scientific visit to explore the implementation of UK advanced practice radiation therapist roles, proactively in pursuit to addressing their demand.

Aims: The objective was to comprehend the infrastructure of the advanced practitioner radiographer role in the UK, with a view to establish similar positions in Singapore and improve service delivery within its healthcare system.

Methods: During the scientific visit, Singaporean experts engaged in collaborative discussions with UK expert practitioners. These interactions centred on legislative frameworks, applications, and educational aspects of advanced practitioner radiographers. The specialists further visited three departments and a university for deeper insights. Following the visit, a survey was conducted to gather participants' comprehensive feedback.

Findings: Active participation led to a nuanced understanding of the UK's advanced practitioner radiographer role, revealing the feasibility of implementing an equivalent advanced practice radiation therapist framework in Singapore. The insights garnered are instrumental for strategic planning, addressing service gaps and fostering advancements in Singapore's healthcare.

Conclusion: Adaptive governance of advanced practice is essential. Learning from the UK's intricate models can guide robust policy formulation and professional role development in Singapore, facilitating the national establishment of advanced practice radiation therapist roles supported by suitable education and accreditation structures.

Keywords: Advanced Clinical Practice, Radiation Therapy, Singapore Healthcare, Knowledge Exchange.

1.1 INTRODUCTION

The healthcare landscape in Singapore is dynamic. Given the rapid advancements in healthcare technology, there is an increasing demand for specialized skills in managing specific cancer cases within radiation therapy practice. This demand has created opportunities further for Radiation TherapisTs (RTTs) to address service gaps such as patient treatment timeliness, treatment quality and to increase job satisfaction, as highlighted in studies by Lim et al. (2020) and Wong et al. (2021). Therefore, as regional health systems in Singapore strive to remain contemporary, there is a need to broaden the roles of existing allied health professionals to meet service demands. The study centered on advanced practice radiation therapy (APRT) roles in Singapore and explored the comparable roles of advanced practice radiographer (UKAPR), specifically in England. This examination considered operational implementation, serving as a reference for countries aiming to enhance their services. This collaboration offers mutual benefits, fostering cultural exchange and diversity and facilitating knowledge exchange, thereby encouraging innovative approaches and expanding the scope within APRT. A team of three experts from the National University Health System (NUHS) visited the UK in February 2023 (chief RTT; senior

principal RTT; senior consultant clinical oncologist). The main goal of this visit was to investigate the scope of practice, educational pathways, training aspects, and career advancement possibilities linked with UKAPR roles. The intention was to learn to see how to establish comparable positions in Singapore, thereby enhancing service delivery within its healthcare system.

With patient safety at the core, the purpose was to utilise this knowledge i to devise and, if feasible, implement analogous structures not only within NUHS but also within the broader landscape of Singapore's healthcare sector. This involved comprehending methods to proficiently assess RTT competencies, contextualise them in terms of consultant practitioner and enhanced practitioner roles, address legal considerations, and navigate framework-related matters.

1.2 BACKGROUND

In response to the growing complexity of cancer cases and advancements in healthcare technology, specialised expertise in radiation therapy practice has become crucial (Wong et al. 2021). Traditionally, RTTs focused on delivering treatments guided by clinical oncologists. However, evolving healthcare needs and regional health system aspirations have led to an expansion of roles for allied health professionals. Advanced practice roles, including APRs in radiation therapy, have emerged to meet the demand for specialised skills (Olivera et al. 2022; Stewart-Lord et al. 2022; Khine and Stewart-Lord 2021).

In 2017, Health Education England (HEE), NHS England (NHSE), and NHS Improvement collaborated to establish a national framework for advanced clinical practice (NHSE 2017a). This initiative was driven by the challenges outlined in NHSE's Five Year Forward View (2014) and a subsequent NHSE document, Next Steps on the Five Year Forward View (2017b), addressing workforce gaps within the NHS in England. These documents acknowledged the strain on the healthcare workforce due to rising service demands. The multi-professional framework for advanced clinical practice provided a universally accepted definition applicable across professions and contexts. This standardized definition of advanced clinical practice aimed to address disparities, ensuring consistency across professions and levels of practice. The College of Radiographers (CoR) subsequently published specific guidelines in their education and career framework, outlining the knowledge, skills, and attributes of advanced clinical practice in radiography (SCoR 2022).

Recognising the need to bridge clinical gaps and enhance service efficiency in Singapore, the NUHS explored the implementation of AP roles within radiation therapy. NUHS represents one facet of Singapore's health cluster, alongside SingHealth and National Healthcare Group. Drawing insights from the well-established AP roles in the UK, the NUHS team sought to understand scope of practice, educational requirements, and career pathways associated with these roles. Challenges identified in the UK, such as misalignment of job descriptions hindering the fulfillment of AP roles were acknowledged (Harris et al. 2021).

The outcomes of this study will guide the development and implementation of AP roles within NUHS. Leveraging knowledge from the UK visit, NUHS aims to empower RTTs to effectively manage complex cancer cases and address Singapore's evolving healthcare needs. The insights gained from this endeavor will contribute significantly to enhancing the capabilities of RTTs and improving cancer care in Singapore overall.

2.1 METHODS AND MATERIALS

2.2 Collaboration and components

The collaboration between the NUHS and the University of the West of England, Bristol (UWE) UK began in early 2022 to facilitate a one-week scientific visit funded by the International Atomic Energy Agency (IAEA). Deliberate planning and execution of viable strategies within the designated timeframe involved extensive discussions among the lead author, acting as the coordinator, clinical center practitioner leads, and subject matter experts. Key considerations encompassed assessing the practicality of UK-based host institutes, evaluating the accessibility of hosting clinicians, and exploring the diversity observed in radiotherapy practices, covering areas such as head and neck cancer, breast cancer, and treatment planning. The objective was to gain valuable insights into several aspects, including the scope of advanced practice (AP), educational prerequisites, training

pathways, career development possibilities akin to UKAPRs, and relevant governance structures. Consequently, stakeholders were selectively invited based on this rationale.

The final visit program encompassed interactions at a round table consultation meeting with a professional officer from the Society & College of Radiographers (SCoR) and subject matter expert on AP education and training for therapeutic radiographers, as well as clinical radiotherapy experts at the University College London Hospitals NHS Foundation Trust, Musgrove Park Hospital in Taunton, and Cheltenham General Hospital. Furthermore, engagement with UWE was facilitated to foster a connection between evolving clinical practices and academia.

The inaugural meeting, comprising professional officers, an academic, and experts from Singapore, entailed comprehensive deliberations on various facets within the domain of Advanced Clinical Practice (ACP) roles. The discussions encompassed topics such as governing structures, educational aspects, career frameworks, legislative considerations, and the most recent advancements within the radiography profession. During the meeting, essential qualitative data were collected through the interactions that occurred between the participants. Following the meeting and the week-long visit to various clinical and academic centres, a post-visit questionnaire was distributed to the team of visiting experts from Singapore. The purpose of this questionnaire was to systematically gather information pertaining to participants' perceptions, opinions, and reflections on the settings visited. The survey comprised a meticulously crafted set of 15 questions formulated by the academic team to align with the study's precise objectives. These aimed to grasp the structural essence of the advanced practitioner radiographer role in the UK. The study sought to gauge perceptions on the feasibility of establishing AP roles in Singapore and assessing the infrastructure viability within Singapore NHUS. This included capturing their intellectual perspectives, agreement on decisions, exploring thoughts, and identifying potential opportunities.

The utilisation of collaboration between NUHS and UWE, along with strategic planning of the visit program, allowed for the exploration of various aspects related to AP in radiotherapy. The engagement with key stakeholders, including professional bodies, healthcare providers, and academia, provided valuable insights into the current practices, educational requirements, and future development of AP roles.

2.3 Visit Evaluation – Data collection and analysis

The evaluation of the scientific visit's impact on collective outcomes was conducted through a formative approach. Predetermined aspects of the visit were also assessed. To gauge the influence of the visit on joint outcomes, an unrestricted open-ended self-report questionnaire was administered to all three participants following the visit. The combined results encapsulated participants' newfound insights into the viability, applicability, and developmental implications linked to evidence-based clinical role advancements. It also covered significant medical directives, aspects influencing practice guidelines, and potential collaborative prospects between Singapore and the UK for advancing professional roles and technology initiatives. The author assessed meeting minutes and conducted thematic analysis to derive overarching themes (Braun & Clarke, 2006).

The questionnaire employed in this study adopted a standalone qualitative design, intended to elicit comprehensive and descriptive responses from the participants post visit. It consisted of fifteen open-ended questions that aimed to explore various dimensions related to the outcomes of the visit.

3.1 FINDINGS

3.2 Knowledge Exchange Meeting Outcomes

The findings obtained through the two-part methodology (consultation meeting outcomes and a post-visit questionnaire) offer insightful perspectives that not only bring clarity to the subject but also provide valuable indications on how the scientific visit supports Singapore's healthcare reform concerning APRT through potential implications, extend to the broader healthcare landscape. The first part, the opening consultation meeting of the scientific visit comprised of primary knowledge-sharing data. The data revealed several critical points of discussion related to professional, legal and governance themes. These are summarized in *Diag. 1 – Categorization of discussion themes.*

Categorization of Consultation Meeting Themes

In line with the Venn diagram above, key discussion points from the consultation meeting are further elaborated and grouped in appropriate themes in Table 1.

Table 1. – *Proposed Themes Identified by UK Subject Experts during the Consultation Meeting*

Professional:
- Guests are urged to explore a comprehensive range of significant reform documents starting from the year 2000, encompassing essential papers such as the NHS Plan, the Department of Health's "Meeting the Challenge: A Strategy for the AHPs" (NHSE, 2000), leading up to subsequent reports like the Radiography Skills Mix (DH, 2003), culminating in the current Education & Career Framework for the Radiography Workforce, 4th Edition (SCoR, 2022). - The significance of masters-level postgraduate education and training should be considered as an essential component to demonstrate skill, knowledge & competence of AP roles. Upon finishing an accredited MSc ACP program or obtaining endorsement for an existing MSc guided by the Centre for Advancing Practice and aligned with Health Education England's multi-professional framework for advanced clinical practice in England (2017), practitioners will receive a digital badge. - Another pathway for recognition of MSc ACP equivalence involves completing the supported e-portfolio route with the Centre for Advancing Practice, also resulting in a digital badge upon success. Notably, the College of Radiographer accreditation scheme involves portfolio submission for accreditation, yet these pathways are presently independent and not interconnected (SCoR, 2023). - While there is no set curriculum, an MSc vital for ACP in this profession should attain a curriculum that covers essential knowledge, skills, and attributes required for advanced practitioners to fulfill the four pillars of advanced practice framework and comply with the College's accreditation prerequisites.

- To ensure parity among APRT pay bands and job titles, national standardisation in Singapore should be an important factor in institutional development across all health clusters.
- APRT training to be inherently modelled around the Specialist Registrar training approach as an established model that works.
- The NHS long term workforce plan (NHSE, 2023b) to be noted, as this 15-year strategy supports the development and advancement of radiography professionals through workforce initiatives already developed.

Legal:

- Although HCPC regulatory body in the UK are legally responsible for radiographers' standards of conduct and performance (meeting specific educational qualifications, demonstrating competence, and maintaining continuing professional development), they regulate the profession rather than levels of practice.
- The UK's Society of Radiographers provides essential indemnity insurance and professional guidance, ensuring integrity in legal matters and safeguarding patients, practitioners, and services, in collaboration with the regulatory body HCPC, advocating for radiographers' interests and offering comprehensive workforce guidelines.
- Some legal hurdles in the UK have been observed in specific radiotherapy practice areas, particularly in roles like dosimetry, which pose challenges in aligning with the NHSE capability framework for Advanced Practitioners (APs). To address this, a national framework is under development within the non-surgical oncology domain, aiming to evaluate capabilities and levels of trust for these specialized roles. These roles also tend to fall under a broader professional category as outlined by the HCPC which can pose limitations.
- Distinguishing practice levels, as highlighted in HEE (2019) and The Long-Term Plan (2019b), including enhanced, advanced, and consultant practitioners, has been crucial for comprehensive assessment rather than isolated considerations in the UK.

Governance:

- While practitioners must exhibit advanced proficiency across four fundamental domains—expert clinical practice, professional leadership and consultancy, education, training, and development, and practice and service development, research, and evaluation—according to the UK's education and career framework for the radiography workforce (4th edition, 2022), fulfilling the local clinical practice competency sign-off standards set by clinical oncologists remains a requisite for UKAPR.This involves ensuring educational standards are met, enabling learners to bridge theory and practice while fostering critical thinking skills.
- Implementing robust governance measures, such as clinical frameworks and aligning job descriptions, serves to protect practitioners and cultivates a culture that encourages reporting errors without fear of blame. This approach fosters a blame-free culture within the organization, ensuring practitioners feel supported and safe in reporting errors for the betterment of patient care and service improvement.

The mentioned themes highlight the key elements necessary for crafting a governance structure for APRT, balancing flexibility to accommodate varying rates of role development across Singapore's health clusters while ensuring clarity and definition in practice parameters. This framework should support profession-specific initiatives and learn from the complexities observed in the UK, using those insights to shape a more comprehensive regulatory framework that caters to diverse needs and fosters inclusivity.

3.3 Post scientific visit questionnaire outcomes

The subsequent phase of the methodology involved the administration of a post-scientific visit feedback questionnaire. Analysis of the feedback revealed that the advancement of AP in Singapore's radiotherapy practice was at an early stage. Identified challenges were highlighted with AP roles. Additionally, several facilitators were recognized, notably the identified service requirements for these roles and the availability of professional development opportunities for Radiography Technologists (RTTs). Delegates highlighted that the scientific visit significantly enhanced their comprehension of the broader concept of advanced practice, yielding distinct themes, namely: 1) conception, 2) challenges, 3) enablers, and 4) insights.

Conception

The feedback provided by the Singaporean visiting experts acknowledged that in within the National Cancer Centre, Singapore (comparable hospital facility to the NUHS), AP was still in its infancy. Several sub-clinical sites were initially identified as part of plans to develop AP roles. The 'Head and neck' specialism was selected by the gathered radiation oncologists and RTTs as the first field to develop an AP role for, and a planned training programme structure to support. Some of their key responses were:

"They first started with the Head and neck APRT role where a structured 1-year residency training program was developed for the training. The programme consisted of structured lectures, and clinical practice-based modules where APRT residents receive structured mentoring under a mentorship program. Competency and Assessment Framework were setup to assess the core competency areas."

Moreover, the analysis of the survey also acknowledged the importance of stakeholders to aid in the conception of AP roles:

"We would need to include Oncologists in other institutions, Hospital Senior management, Allied Health Regulating Body".

Challenges

Several challenges were also acknowledged from the post visit feedback. These included areas such funding issues and unfamiliarity of AP roles:

"Lack of awareness on the advance role of RTT, no funding to support the advance role development for RTT, no national guidelines to support advance practice and renumeration for advance roles."

In addition, the feedback also highlighted the potential disinclination toward accepting AP roles from patients:

"Patients may not be aware or accept RTT to lead the treatment review. They may still prefer to see a doctor."

The visitors were equally keen to acknowledge solutions to the challenges if the AP RTT role is successfully adopted by the workforce:

"We need to educate and to communicate with patients in advance that the care model is a team effort consisting of both RTTs and doctors."

"The funding will mainly be the hospital training funds. We are currently exploring opportunities to seek funding from other national skill training or cancer society's funding."

Enablers

Several enablers were also acknowledged, specifically service needs of such roles and professional development opportunities for RTTs:

"The gaps are in palliative, head and neck cancer, breast cancer sites and IGRT and advance technology and techniques."

"The development of APRT role can also help to promote the profession as RTT's are now able to undertake more roles and responsibilities."

Alongside the above afore mentioned, the delegates were keen to highlight that the enablers can also provide benefits such as the positive impact on patient care:

"The development of APRT role can help to improve patients' experience and care during their treatment."

Insights

The delegates commented on how the scientific visit provided them with a greater insight into the whole concept of advanced practice which was seen as beneficial to them:

"The visit has provided us with a better understanding of the development of the APRT in UK, the different roles and responsibilities of the APRT".

Moreover, the opportunity to learn from others engaged in AP, in particular reference to the UK work:

"There are many areas that we can learn from the work done by UK professional bodies. Some of the areas of practice include development of professional development framework, guidelines for the regulation of advance practice, roles of professional bodies and CPD."

"There are lot of things that we can learn from the UK experience in APRT."

4.1 DISCUSSION

Recognition of radiotherapy's efficacy in treating oncology patients has expanded globally (Duffton et al. 2019) and the development of RTT roles in Singapore has been driven by this increasing healthcare demand (AHPC Singapore 2023). This has led to the acknowledgment and emergence of advanced practice roles, shaping related job descriptions and scopes of practice. To demonstrate RTT proficiency in AP, a recent study (Sin et al., 2021) compared the assessment of side effects in nasopharyngeal cancer patients between radiation oncologists and APRTs in head and neck radiation therapy working within the SingHealth health cluster. The findings revealed a strong agreement in grading side effects, indicating the feasibility and potential contribution of APRTs in patient assessment, emphasizing the significance of timing for the APRT launch in Singapore's practice. The initiation, however, requires support from national workforce guidelines and frameworks which are yet to be formalized by the country's government body (MOH 2023). Contextual differences and potentially swift cultural changes may be the cause for hesitation in deviating from existing norms, along with concerns related to risk aversion towards accelerated adoption of APRT roles within NUHS and across other health clusters. The Allied Health Professions Council (AHPC) in Singapore, operating under the Ministry of Health, regulates the behavior and ethical standards of registered allied health professionals nationally, in line with legislation, more specifically, the AHP Act 2011 (from the Attorney General's Chambers of Singapore: SSO 2023). It oversees registration, certification issuance, training standards, and maintains a comprehensive register of allied health professionals across Singapore, akin to the role of HCPC in the UK.

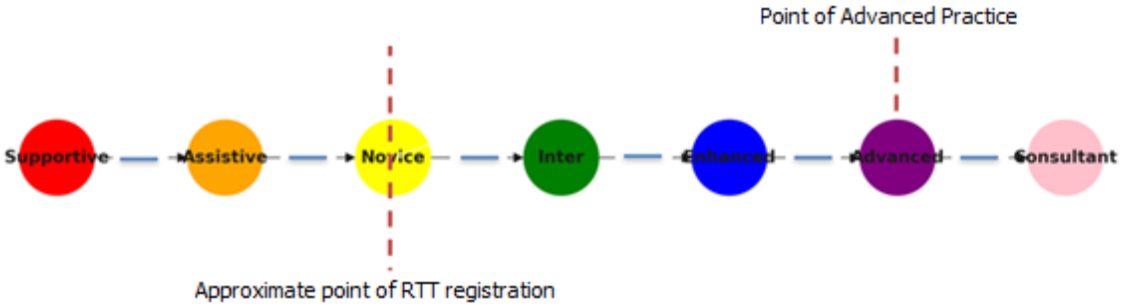
Though it is challenging to offer a unified global view on AP in RT due to differences in educational systems, workforce dynamics, and resource availability (Duffton et al. 2019), various countries beyond the UK have effectively established policies and frameworks supporting AP roles. For instance, entities like the Australian Society of Medical Imaging and Radiation Therapy and the Canadian Association of Medical Radiation Technologists (ASMIRT 2017; CAMRT 2016) have successfully integrated AP into multidisciplinary teams (MDTs). However, a notable contextual challenge could stem from their healthcare financing strategy.

Singapore's healthcare system differs from the UK's, employing a mixed approach that involves government subsidies, mandatory savings (Medisave), insurance coverage (Medishield Life), and direct out-of-pocket payments (Health Hub 2023). Singapore's Ministry of Health may emphasize workforce development strategies that align with this mixed system, focusing on specific skill sets and training to maximize the use of these diverse financing mechanisms. Conversely, HEE, operating within the UK's NHS (now inferred as NHSE), may concentrate on workforce strategies tailored to a predominantly publicly funded healthcare system, crafting training programs and workforce planning to suit the needs of a system heavily reliant on government funding and resources.

As the career framework for the UK's radiography workforce evolves, the importance of viewing AP as an integral part of a larger framework has become evident. The recognition of diverse career progressions traces back to

2003 when assistant practitioner roles were initially acknowledged by the government (Radiography Skills Mix, DH 2003). Since then, there have been developments in enhanced, advanced, and expert practice levels (among others), forming a cohesive pathway. This holistic approach not only influences job descriptions but also extends to job plans, enabling hospitals and systems to strategize comprehensive career progression for practitioners. Such initiatives (see diag. 2) are pivotal in developing profession-based workforce planning strategies, ensuring a consistent supply of skilled healthcare professionals (DHSC 2013; NHSE 2014). This is particularly important for NUHS towards a step that ensures parity among APRT pay bands and job titles. National standardisation in Singapore should be an important factor in institutional development across all health clusters.

Diag. 2 – Journey map demonstrating workforce specialist knowledge and skills inspired by the Workforce Modelling Project for HEE for RTTs (HEE, 2019).



This map identifies the approximate point of registration towards the progression point relevant for advanced practice.

Given the absence of an AP structure in radiotherapy, efforts are underway to build a comprehensive career pathway (AHPC Singapore 2023, Lim et al. 2020). The Singapore Society of Radiographers (SSR), the Singapore Society of Oncology (SSO), alongside supportive government agencies providing funding for role development (SSR 2023, SSO 2023b, MOM 2023, SCO 2023), may contemplate devising a workforce progression model. This endeavor aims to expedite a concept that took the UK several years to develop. It should be borne that the safeguarding of career progression levels is specifically ensconced within the protective sphere of professional titles, notably within the realms of diagnostic and therapeutic radiography. This configuration presents a favorable aspect, allowing a certain degree of autonomy in crafting career progression pathways. This autonomy is underpinned by comprehensive research and remains responsive to nationally indicated needs (Appleyard, Nightingale and Labinjo, 2021).

Due to the UK's demographic diversity shaping local hospital needs, disparities in accessing UKAPR training routes have led to unequal opportunities across practice areas for Continuous Professional Development (CPD) and career advancement. Consequently, there exists a discrepancy in the qualifications and experience held by UKAPRs. Addressing these challenges, the ScoR's education and career framework (4th edition, 2022) emphasizes the importance of standardized and benchmarked training routes which involves ensuring educational standards are met, enabling learners to bridge theory and practice while fostering critical thinking skills. These disparities highlight potential challenges for Singapore's health systems such as NUHS to consider and potentially avoid.

Despite the absence of a formalized curriculum, the pursuit of an MSc remains pivotal for UKAPRs, offering a structured educational pathway essential for APs to meet the requirements outlined in the multi-professional framework for advanced practice in England (NHSE 2017a). Emphasizing capability development, this framework underscores the necessity for practitioners to discern the required level of competence within diverse situations rather than focusing solely on educational processes. This flexibility enables practitioners to adapt and extend their expertise as per service demands. This pursuit aligns with the accreditation criteria established by the

College of Radiographers (CoR), addressing specific service-related needs and ensuring compliance with the local competency sign-off standards set by clinical oncologists/experts for UKAPRs. Alternatively, achieving recognition of MSc AP equivalence involves participation in the supported e-portfolio route offered by the Centre for Advancing Practice, culminating in the attainment of a digital badge upon completion (SCoR, 2023). Nevertheless, it is useful to note that while the CoR's accreditation scheme involves portfolio submission for accreditation, these pathways currently function independently without integration (SCoR, 2023). However, employing such viable UKAPR mechanisms enables NHSE to amplify advanced practice training by 46% within the forthcoming 15 years, intending to enroll 5,000 clinicians annually in advanced practice pathways, including therapeutic radiographers (NHSE 2023b). It showcases the government's trust in the efficacy of training and accreditation mechanisms for the AP workforce.

Australia, along with nations like New Zealand, seems to be actively embracing innovative educational approaches in CPD, as seen through initiatives like MSc AP programs designed to suit practitioners' needs, clinical settings, and professional requisites, irrespective of a national capability framework for standardization (Wright & Matthews, 2022; UO, 2023). Given the absence of such courses in Singapore's higher education institutes, NUHS practitioners might consider exploring available international options. Alternatively, if Singapore's health systems, professional organizations, and respective government bodies trust international training standards and educational alternatives, the recognized authorities in those countries leading in the APRT domain should formally recognise and support the extended scope of practice for APRT professionals in Singapore. This formal acknowledgment might play a crucial role in expediting policy changes overseen by the governmental body regulating the country's RT profession.

While the HCPC holds legal responsibility for regulating radiographers' conduct and performance, including educational qualifications, competence, and ongoing professional development, NHSE's stringent workforce guidelines further empower eligibility for professional bodies to offer indemnity insurance. This coverage shields practitioners from legal claims tied to their professional practice and is commonly included in their membership benefits with the professional body (SCoR, 2020). Private insurance, known as medical malpractice insurance, also provides policies tailored to healthcare practitioners' specific needs, safeguarding them against legal claims associated with their professional practice. As the profession's regulator, HCPC in 2014 mandated professional indemnity cover for each registrant when they practise (HCPC 2014) which safeguards patients, practitioners, and services alike. In the Singaporean context, the SSR does not furnish indemnity insurance to RTTs, necessitating practitioners to rely on their hospital establishments for coverage (Allied World Insurance 2023). This arrangement, however, constrains the extent of coverage, impeding its comprehensive extension across healthcare settings and professional activities, such as AP, on a national scale.

4.2 Post-scientific visit questionnaire outcomes

The findings from the post-scientific visit questionnaire outlined crucial themes: conception, challenges, enablers, and insights regarding the development of APRTs. In the realm of conception, the analysis revealed that AP was still in its early stages of progression within SingHealth, one of the three health clusters in Singapore, with plans to introduce AP roles across other clusters. The initiative commenced with a structured one-year residency training program focusing on Head and Neck specialization, backed by mentoring and competency assessment frameworks. Stakeholder involvement, particularly from oncologists, hospital management, and regulatory bodies, was highlighted as pivotal in shaping AP roles.

However, challenges loomed large. The lack of awareness, funding, national guidelines, and patient acceptance emerged as prominent hurdles. Proposed solutions included patient education about collaborative care models and exploring various funding avenues, primarily relying on hospital training funds and seeking external support.

Conversely, enablers for APRT roles encompassed identified service needs in specific cancer sites and technology advancements. The development of APRT roles was viewed as a means to expand professional responsibilities, potentially enhancing patient care experiences.

Insights gleaned from the visit highlighted the benefits of understanding the UK's advanced practice model and its diverse roles and responsibilities. Learning opportunities from the UK's government and professional bodies, especially regarding professional development frameworks, regulatory guidelines, and continuous learning, were acknowledged as invaluable.

4.3 Healthcare Partnerships

If we examine other healthcare system approaches, taking an inter-system perspective emphasizes the potential advantages of institutional healthcare partnerships, notably showcased through the concept of twinning. This method, as posited by Kelly et al. (2015), envisages the exchange of knowledge, expertise, and resources between healthcare institutions from diverse regions, fostering a mutual learning process and bolstering advancements in healthcare delivery, education, and infrastructural development. A seminal concept analysis conducted by Cadée et al. (2016) highlighted four pivotal attributes intrinsic to healthcare twinning. Among these, reciprocity emerged as the most frequently cited attribute, complemented by job satisfaction, retention, the development of personal relationships, the dynamic nature of the collaborative process, and the participation of two distinct organizations across diverse cultural landscapes. Extensive literature substantiates the empowering effect of these attributes on healthcare professionals engaged in transformative healthcare and systems change endeavors (Sors 2022; Herrick, Reubi and Brown).

Within the context of this discourse, an intriguing prospect emerges for potential collaboration between Singapore's health clusters and a well-established healthcare region within the UK. Such collaboration could hold feasibility in leveraging practical insights and lessons from elected the UK region, particularly considering factors like population size, hospital resource comparability, health professional numbers, and the intricacies of radiotherapy practice, notably in the effective deployment of Advanced Practice Radiography (APR) roles.

By harnessing experiential knowledge derived from an elected UK region, a bespoke framework tailored to Singapore's unique healthcare landscape could be envisaged. This framework, poised to provide a nuanced and context-specific approach, could substantiate region-specific recommendations to Singapore's health ministry, thereby serving as a persuasive case for achieving legal coherence and the efficacious implementation of transformative healthcare strategies.

5.1 LIMITATIONS AND RECOMMENDATIONS

In advancing APRT in Singapore, a comprehensive approach that addresses both strategic limitations and scopes for future research is necessitous. The disparity in data scope and availability between Singapore and the UK is a significant limitation. This necessitates the acquisition of comparable longitudinal data to assess the effectiveness of APRT role implementations comprehensively.

National consultations involving experts from Singapore's health clusters - NUHS, SingHealth, and NHG - are imperative. These consultations will drive APRT discussions forward, ensuring alignment with the ministry's healthcare strategies. Further, aligning the APRT working group, in collaboration with the UK, may prove effective for developing governance frameworks that support Singapore's AP ambitions.

The official acknowledgment and approval of expanded APRT practices by professional organizations are crucial. This is especially significant for Singaporean practitioners adopting the UK's education and training framework, as they might consider seeking recognition and endorsement from the UK's professional bodies. Such recognition could, in turn, offer assurance regarding the necessity for interim policy changes by Singapore's Ministry of Health.

Such recognition will facilitate policy changes under Singapore's Ministry of Health and AHPC, governing RTs. This is a key step in integrating APRT roles effectively within the healthcare system.

In future research, the essential task is to establish a Singapore based CPD education and training framework. Drawing inspiration from the successful UK model, this framework should concentrate on validating practitioner expertise and skills through an accreditation system. Additionally, exploring healthcare partnerships and twinning with the UK, particularly in oncology, can bring mutual benefits. These partnerships can leverage the similarities in infrastructure to enhance the quality of services.

Conducting rigorous longitudinal studies is essential to understand the long-term consequences of APRT role implementations. These studies should focus on healthcare outcomes, efficiency, and patient satisfaction, providing insights into the effectiveness of these roles.

By addressing these strategic measures and focusing on the identified areas for future research, Singapore can effectively integrate APRT roles into its healthcare system. Drawing inspiration from the UK model and fostering international collaboration will ensure improved patient-centric services.

6.1 CONCLUSION

In this conclusion, we underscore the significance of NUHS's initiative to harness global insights for enhancing Singapore's APRT infrastructure. The IAEA-funded scientific visit was pivotal, providing a template for knowledge, skill, and practice guidelines specific to Singapore's healthcare context. This international learning is not only instrumental in shaping Singapore's evolving AP landscape but also acts as a catalyst for local authorities to reevaluate and establish regulations regarding APRT autonomy, including the implementation of an effective indemnity protection charter.

Addressing inherent challenges like cultural differences and hesitancy to change within the healthcare system requires a nuanced and targeted approach. By leveraging lessons from global best practices, Singapore can navigate these challenges more effectively.

Furthermore, the learnings from this initiative hold potential benefits for other nations facing similar challenges in their healthcare professions. The collaborative model serves as a blueprint to overcome professional, legal, and governance barriers, thereby fostering the advancement of healthcare policies globally.

This conclusion aims to not only summarize the current progress but also to project a forward-looking perspective on the role and impact of APRT in Singapore's healthcare system, highlighting its potential as a benchmark for wider healthcare advancements.

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