



Contents lists available at ScienceDirect

Technical Innovations & Patient Support in Radiation Oncology

journal homepage: www.elsevier.com/locate/tipsro

Perceptions on site-specific advanced practice roles for radiation therapists in Singapore – A single centre study



Li Hoon Lim^{a,b,*}, Eric Pei Ping Pang^a, Hansa Jadva-Patel^b, Sharon Mei Mei Wong^a

^a Division of Radiation Oncology, National Cancer Centre Singapore, 11 Hospital Crescent, Singapore 169610, Singapore

^b School of Radiography, Faculty of Health, Social Care and Education, Kingston University & St George's, University of London, Penrhyn Road, Kingston upon Thames, Surrey KT1 2EE, United Kingdom

ARTICLE INFO

Article history:

Received 30 August 2019

Received in revised form 21 November 2019

Accepted 25 November 2019

Keywords:

Advanced practice radiation therapist

Site-specific advanced practice

Radiation therapy

APRT

Role expansion

ABSTRACT

Perception of the radiation oncologists (ROs) and radiation therapists (RTTs) on site-specific advanced practice (SSAP) roles for RTTs, the establishment of SSAP in radiotherapy and the possible implication on current services in Singapore were assessed. Opinions of ROs and RTTs on management support, driving forces, restraints and implication upon successful establishment of SSAP were obtained. Main findings include strong RO's support for SSAP development and RTTs' requisition for fair opportunities on role development. Other potential benefits include RTTs' career advancement, job satisfaction and retention. Enhancement of inter-professional relationship, service quality and patient satisfaction is anticipated with greater communication and collaboration.

© 2019 Published by Elsevier B.V. on behalf of European Society for Radiotherapy & Oncology. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Globally, the concept of advanced practice radiation therapists (APRT) is well-established in the United Kingdom, Australia and Canada [1–3]. However, the concept is relatively new locally. In Singapore, Radiation therapists (RTTs) undergo four years of undergraduate education and professional training to be equipped with the essential knowledge and skillset such as immobilization, treatment planning, image registration and treatment delivery. These core skills [4] are key to the function of a radiation therapist and continuous learning are imperative to the professional growth. It is widely accepted that sub-specialization allows one to pursue professional excellence and promote new knowledge of the particular area.

The Society and College of Radiographers (SCoR) envisioned that site-specific advanced practice (SSAP) will support the patient across the radiotherapy pathway by providing co-ordinated care for a selected group of patients by case mix [5]. SSAP roles include expert practice, professional leadership, education, training and development, service development as well as research and evaluation [6]. The focus on SSAP was such that the ROs specialised in specific sites, which would allow the ROs and RTTs' perspectives

on the development of SSAP roles for RTTs to be assessed. This study will discuss some of the driving forces and restraints in the development of advanced practice radiation therapists (APRT) roles and elicit the area of service needs and possible implications on radiotherapy services.

Materials and methods

Ethics approval was obtained from the local centralised institutional review board in February 2013. A pilot survey was developed to establish the content validity of the questionnaire, improve questions format and scales and ensure that the questions were applicable to the local context [7,8]. Five participants [RO, manager, Principal RTT, RTTs (≥ 5 and < 5 years)] were randomly chosen based on their designation and working experience. Subsequently, 88 questionnaires were distributed in the Division of Radiation Oncology (DRO), National Cancer Centre Singapore (NCCS) to 26 ROs and 62 RTTs between 13th and 15th March 2013, for completion over a two-week period.

A mixed-method semi-structured questionnaire was adopted to collect quantitative data with the flexibility for the respondents to share their views and raise other relevant issues not covered in the questionnaire [9]. An invitation letter (Appendix A) along with a questionnaire (Appendix B) were disseminated to elicit issues that were widely reported in the literature; concept and understanding of SSAP, requirements, driving forces, restraints, impact on

* Corresponding author at: Division of Radiation Oncology, National Cancer Centre Singapore, 11 Hospital Crescent, Singapore 169610, Singapore. Fax: +65 62228675.

E-mail address: lim.l.h@nccs.com.sg (L.H. Lim).

professional development and service quality. Consequently, main themes were derived from the open-ended questions for discussion.

The questionnaire consisted of two nominal questions and five four-point Likert scale questions to elicit the respondents' views on several statements. The scale was used to prevent participants from choosing the 'neutral' category that is present in a five-point scale. Open-ended questions in the second part of the questionnaire aimed to elicit the rationale behind the option choice of the respondents, which would provide an in-depth understanding and insight to the respondents' perception. The quantitative data was analysed by the non-parametric Mann-Whitney test using PASW for windows, version 19.0 (SPSS Inc, Chicago, IL), while content analysis was adopted to derive main themes from the qualitative data in the open-ended responses.

Results

Overall response rate was 85% with 17 (65%) ROs and 58 (94%) RTTs completed the questionnaire respectively.

Roles and potential areas of SSAP

Breast, Head and Neck, Gynaecological, Palliative and Lung were the top five clinical sites nominated to benefit from SSAP (Table 1). Multifaceted dimension in roles such as clinical, research, teaching and education, quality improvement programs, dosimetry and audits were highlighted as potential roles and responsibilities of APRTs (Table 2). Majority of the respondents [eight (30.8%) ROs and 43 (70.0%) RTTs] felt that the prescription of medicine lies beyond the scope of practice of the APRTs.

There was no statistically significant difference ($p > 0.05$) between the opinions of the ROs and the RTTs in three out of the five questions (Table 3). None of the ROs and RTTs has responded as "strongly disagree" in the questions. However, there is a statis-

Table 1
Clinical sites nominated to benefit from SSAP.

Clinical sites	RO (n = 17)	RTT (n = 58)
Breast	11 (64.7%)	53 (91.4%)
Head and Neck	15 (88.2%)	48 (82.8%)
Gynaecology	15 (88.2%)	38 (65.5%)
Palliative	11 (64.7%)	34 (58.6%)
Lung	13 (76.5%)	32 (55.2%)
Urology	10 (58.8%)	23 (39.7%)
Colo-rectal	8 (47.1%)	19 (32.8%)
Paediatrics	10 (58.8%)	16 (27.6%)
Brain	7 (41.2%)	16 (27.6%)
Gastro-intestinal	7 (41.2%)	15 (25.9%)

Table 2
Roles and responsibilities of APRTs.

Roles and responsibilities	RO (n = 17)	RTT (n = 58)
Clinical	13 (76.5%)	56 (96.6%)
Research	13 (76.5%)	47 (81.0%)
Teaching and education	15 (88.2%)	46 (79.3%)
Quality improvement programs	11 (64.7%)	45 (77.6%)
Dosimetry	8 (47.1%)	35 (60.3%)
Audits, trials	12 (70.6%)	34 (58.6%)
Logistic	12 (70.6%)	8 (13.8%)
Administrative	10 (58.8%)	8 (13.8%)
Others (Please state):	3 (17.6%)	2 (3.4%)
Patient counselling,		
Family counselling		
Toxicity management		

tical significant difference between the ROs' and RTTs' perceived benefits in continuous professional development (CPD) and lifelong learning (LLL) with AP ($p = 0.009$).

Criteria, driving forces, restrains and benefits of SSAP on radiotherapy services

Three main themes (Expert practitioner, Implication on current setting and Service quality) were derived from the qualitative responses in the open-ended questions. Table 4 summarises the different aspects of implementation to highlight the respondents' perspectives on the criteria, driving forces, restrains and benefits of SSAP on radiotherapy services.

Discussion

Roles and potential areas of SSAP

The rationale of the nominated clinical sites (Table 1) that will benefit from SSAP ranged widely from the demand of expedited care processes for palliative cases, toxicity monitoring and management for breast and head and neck cases and image guidance required for applicator insertion during brachytherapy for gynaecological cases. The diversity of roles and responsibilities also reiterated the potential of APRT contributions (Table 2). However, 51 (68%) of the respondents acknowledged that certain isolated roles (e.g. medicine prescription) fall outside the scope of APRT professional practice and boundaries, due to the medico-legal issues related to prescribing rights.

Both groups of respondents agreed that SSAP would improve RTTs' professional standards, had advantages in DRO and had management support for the role development (Table 3). Although the respondents agreed that AP will encourage CPD and LLL and RTTs' support of AP development, ROs demonstrated stronger support in these two areas ($p = 0.009$). This is because some RTTs felt that CPD is dependent solely on 'the initiatives of the individual'. Nonetheless, 66 (88.0%) respondents felt that the management was supportive of SSAP development for the RTTs.

Criteria, driving forces, restrains and benefits of SSAP on radiotherapy services

This study has contributed to the awareness of APRT roles that put into perspective the expectations and the perceived impact of SSAP on current radiotherapy services (Table 4).

Expert practitioner

ROs and RTTs highlighted that a highly comprehensive and well-structured training program would be necessary to ensure that the APRTs were well-trained and equipped with the necessary skills and abilities to execute the new roles. A recent benchmarking guideline on competency requirements for RTTs was released by the European Society of Radiotherapy and Oncology (ESTRO) to assist the development of postgraduate radiotherapy-specific curriculum at two distinct levels of AP and requisite of education [4]. This comprehensively described the knowledge and skill framework required at different levels of AP and provided a common understanding on the levels of recognition in terms of the required academic and professional competencies [4]. The APRTs were regarded as experienced and clinically competent RTTs, an advocate of evidence-based practice (EBP) and possess the knowledge to provide due care for the patients. AP clinical status needs to be reinforced by academic qualifications [6] for increased authority and autonomy [10]. Additionally, personal traits were considered to contribute to job performance and reported to impact on profes-

Table 3

Results of the Mann-Whitney test demonstrating the level of agreement between ROs and RTTs.

Questions	Level of agreement between ROs and RTTs						p-value
	Strongly Agree		Agree		Disagree		
	ROs	RTTs	ROs	RTTs	ROs	RTTs	
AP will raise RTTs' professional standards.	12 (70.6%)	27 (46.6%)	5 (29.4%)	27 (46.6%)	0 (0.0%)	4 (6.9%)	0.066
There are advantages to having APRTs.	10 (58.8%)	43 (74.1%)	7 (41.2%)	15 (25.9%)	0 (0.0%)	0 (0.0%)	0.226
AP would encourage CPD and LLL.	11 (64.7%)	18 (31.0%)	6 (35.3%)	34 (58.6%)	0 (0.0%)	6 (10.3%)	0.009
The management is supportive of AP development.	4 (23.5%)	7 (12.1%)	10 (58.8%)	45 (77.6%)	3 (17.6%)	6 (10.3%)	0.756
The RTTs are supportive of AP development.	8 (47.1%)	12 (20.7%)	9 (52.9%)	46 (79.3%)	0 (0.0%)	0 (0.0%)	0.032

Table 4

Potential of SSAP and its implication on three levels of implementation.

Expert practitioner	Implication on current setting	Service quality
<i>Attributes</i>	<i>Professional development</i>	<i>Patient satisfaction</i>
1. Working experience	1. Professional standards	1. Personalised patient service
2. Personal traits	2. Career progression	2. Workflow and efficiency
3. Clinical competence	3. Job satisfaction and retention	
4. Post-graduate qualification		
<i>Support</i>	<i>Inter-professional relationship</i>	<i>Clinical specialised roles</i>
1. Management, ROs, RTTs	1. Collaboration and communication	
2. Comprehensive and well-structured training	2. Professional recognition	
3. Remuneration		
4. Transparency and disclosure of plans		
5. Well-defined job description		

sionalism [11]. APRTs were expected to be technically competent, possess the knowledge and skills to meet the expectations of the job, embrace a professional philosophy and act in the interest of service to their patients.

Apart from the provision of learning resources and CPD opportunities; sponsorship and study leave [12], support from the management is vital for any SSAP roles development to take place effectively. Despite the management support, the perceived obstacle was clearly the lack of discussion for RTTs to input their thoughts and manpower shortage. Six (10.3%) RTTs cited 'no disclosure of plans by the management' and three (17.6%) ROs felt that manpower shortage would hinder the progress of any AP development. It is imperative for the development of an efficient system to allocate these resources to bring about tangible benefit for all the stakeholders concerned in providing and participating in CPD and post-registration education [19]. In addition, the fear of overlapping roles, deskilling and impact on another professional groups training had been issues raised by the clinicians [13,14]. Besides, these would inevitably bring about litigation issues as RTTs assume responsibilities previously the domain of ROs [13–15].

Implications of SSAP on current setting

In terms of professional development, there was strong consensus that AP roles would raise the professional standards of RTTs due to the 'autonomy', 'decision-making' and 'responsibilities' involved. Only four (6.9%) RTTs disagreed as they felt that the 'attitudes' and 'work performance' of RTTs defined the professional standards. There was also a unanimous agreement that APRTs would be beneficial to the department by 'promoting inter-professional communication' and providing 'career advancement opportunities'.

SSAP would bring about greater professional development for the RTTs with benefits in career progression and job satisfaction. The expected roles and responsibilities highlighted the multifaceted role of the APRTs. For instance, the clinical expertise of the APRTs not only recognises their specialised knowledge and skills but also retains motivated RTTs in pursue of clinical excellence [16]. Consequently, this would raise the professional standards due to the autonomy and decision-making aspect of the

roles and could in turn enhance the job profile and recognition of the profession among medical professionals. Increased autonomy would bring about empowerment in patient care and consequently job satisfaction [12,17,18]. Potential improvements on staff morale, job satisfaction and recruitment and retention were evident and reiterated by the respondents [19,20], however job dissatisfaction is often the result of several factors and further research is necessary to diagnose the cause of job dissatisfaction in the radiotherapy workforce.

Regarding inter-professional relationship, it was perceived that SSAP would facilitate and improve communication with the other health professionals (e.g. ROs, nurses, physicists) and enhance the efficiency and workflow processes within the oncology service. The findings were further verified by a local report [17] whereby the AP nurses in Singapore reported that job profile was raised with more inter-professional collaboration with other professionals from the multidisciplinary team, resulting in recognition and respect from other health care professionals.

Service quality

The nominated clinical sites which may benefit from SSAP were reflective of the major cancer sites locally [21] and attributed due to service needs; 'high workload', 'complicated planning', 'evolving treatment techniques' and 'side effects'. The respondents believed that AP would bring about greater patient satisfaction due to the personalised service, enhanced workflow and reduced waiting time, which would improve the current service quality of the department. In the United Kingdom (UK), SSAP is very highly recognised across the radiotherapy facilities compared to other specialties [22]. In Ontario, clinical specialised roles for APRTs were also explored with prospects of improving services [1]. However, both groups of professionals affirmed that medicine prescription and brachytherapy were roles beyond the scope of AP, due to a lack of medical, pharmacological and toxicity understanding as well as legislative constraints.

The ROs agreed that the delegation of certain responsibilities (e.g. verification of simulation borders, approval of portal images and treatment reviews) to the RTTs could result in better time

management and personalised care to needy patients. The RTTs also supported role delegations as the ROs could then focus on patients that require medical expertise or tasks such as delineation of target volumes and research. The respondents believed that SSAP would ensure a smooth and efficient pathway for patients in receiving a seamless treatment management upon their cancer diagnosis. Personalised service was described to meet patients' needs promptly; treatment queries and toxicity management, as ROs review patients only once-a-week. The respondents' perception was similar to international experience widely reported by literatures on waiting time and service standards [11,23–26].

Concerns on patient's perception and accreditation were documented, however international studies [11,26,27] have shown that patients were satisfied with the services provided by non-medically trained professionals. Although, the studies mainly reported patient satisfaction in radiographers-led reviews and other delegated roles such as portal image and simulation borders verification were not reported. Nevertheless, AP should be catered to the dynamic and evolving oncology service and react to the development of future practice.

The survey only collected the perception of capability and should not be mistaken with the actual measure of competency itself. Hence, the implementation of advanced roles requires careful reflection on how they fit within the department as an enriched position and how this might link with the rest of the organisational structure [28].

Since the study, NCCS has trained five APRTs based on service needs (Head and neck, breast, gynaecology, lung and palliative). The pre-requisite largely aligned to the study which includes a master degree and a one-year on-the-job training with competency assessment provided by the site-specific ROs.

Conclusion

Development of SSAP is well supported and the respondents believed that promising results could be achieved with the right candidates in these roles. Several benefits of SSAP may include enhanced workflow efficiency, improvement in the professional knowledge of the RTTs, creating a clinical career progression pathway, promoting inter-professional communication and collaboration in clinical care and enhancing service quality with a patient-centred care delivery.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

Special thanks to the Radiation Oncologists and Radiation Therapists of the Division of Radiation Oncology, National Cancer Centre Singapore, for participating in the study and Mr John and Mr Robert Grant from Kingston University, United Kingdom, for providing statistical support.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.tipsro.2019.11.010>.

References

- [1] Harnett N, Bak K, Zychla L, Gutierrez E, Warde P. Defining advanced practice in radiation therapy: a feasibility assessment of a new healthcare provider role in Ontario, Canada. *Radiography (Lond)* 2019;25:241–9.
- [2] Monk CM, Wrightson SJ, Smith TN. An exploration of the feasibility of radiation therapist participation in treatment reviews. *J Med Radiat Sci* 2013;60:100–7.
- [3] Hilder B, VanDam P, Doherty K. Advanced practice radiation therapists: an Australian context. *J Med Radiat Sci* 2018;65:137–47.
- [4] Coffey M, Leech M. The European Society of Radiotherapy and Oncology (ESTRO) European higher education area levels 7 and 8 postgraduate benchmarking document for Radiation Therapists (RTTs). *Technical Innov Pat Supp Radiat Oncol* 2018;88:22–40.
- [5] Society and College of Radiographers. Positioning therapeutic radiographers within cancer services: delivering patient-centred care. London; 2006.
- [6] White P, McKay JC. The Specialist Radiographer - does the role justify the title? *Radiography* 2004;10:217–27.
- [7] Fink A. How to conduct surveys: a step-by-step guide. 4th ed. California: SAGE Publications; 2009.
- [8] Leedy PD, Ormrod JE. Practical research: planning and design. 9th ed. New Jersey: Pearson Education; 2010.
- [9] Bowling A. Research methods in health investigating health and health services. England: McGraw Hill/Open University Press; 2009.
- [10] Price RC, Edwards HM. Dimensions in education and development for advanced and consultant practice. *Radiography* 2008;14:e65–70.
- [11] Cameron JL, Blyth CM, Kirby AS. An audit of a radiotherapy review clinic for breast cancer patients: a multi-disciplinary approach. *J Radiother Pract* 2008;7:233–9.
- [12] Kelly J, Piper K, Nightingale J. Factors influencing the development and implementation of advanced and consultant radiographer practice - a review of the literature. *Radiography* 2008;14:e71–8.
- [13] Shi J, Cox J, Atyeo J, Loh Y, Wong LC, Back M. Clinician and therapist perceptions on radiation therapist-led treatment reviews in radiation oncology practice. *Radiother Oncol* 2009;89:361–7.
- [14] Forsyth LJ, Robertson EM. Radiologist perceptions of radiographer role development in Scotland. *Radiography* 2007;13:51–5.
- [15] Woodford AJ. An investigation of the impact/potential impact of a four-tier profession on the practice of radiography - a literature review. *Radiography* 2006;12:318–26.
- [16] In Health. GBDo, editor. Skills mix: a report on the four-tier service delivery model; 2003.
- [17] Kannusamy P. A longitudinal study of advanced practice nursing in Singapore. *Crit Care Nurs Clin North Am* 2006;18:545–51.
- [18] Probst H, Griffiths S. Job satisfaction of therapy radiographers in the UK: Results of a phase I qualitative study. *Radiography* 2009;15:146–57.
- [19] Spalding M. Towards continuing education and professional development: drivers for change in therapy radiography. *J Radiother Pract* 2003;3:131–8.
- [20] Cameron J. Radiographer review clinics: breast cancer. *J Radiother Pract* 2004;4:33–8.
- [21] In Office NROD, editor. Office NROD. Singapore cancer registry, annual registry report: trends in cancer incidence in Singapore 2011–2015. Singapore; 2017.
- [22] James S, Beardmore C, Dumbleton C. A survey on the progress with implementation of the radiography profession's career progression framework in UK radiotherapy centres. *Radiography* 2012;18:153–9.
- [23] Campbell J, German L, Lane C, Dodwell D. Radiotherapy outpatient review: a nurse-led clinic. *Clin Oncol* 2000;12:104–7.
- [24] Nightingale J, Hogg P. The gastrointestinal advanced practitioner: an emerging role for the modern radiology service. *Radiography* 2003;9:151–60.
- [25] Ellis T, Ashmore L, Bray D. Multidisciplinary radiographer-led review clinics - an example of implementation. *J Radiother Pract* 2006;5:87–95.
- [26] Colyer H. The role of the radiotherapy treatment review radiographer. *Radiography* 2000;6:253–60.
- [27] Treeby J. Prospective cohort survey of patient satisfaction with on-treatment review by advanced practice urology radiographer. *J Radiother Pract* 2008;7:205–12.
- [28] Bolderston A. Advanced practice perspectives in radiation therapy. *J Radiother Pract* 2004;4:57–65.