ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine

TRAINING EDUCATION & ASSESSMENT PROGRAM (TEAP) HANDBOOK

RADIATION ONCOLOGY MEDICAL PHYSICS (ROMP)

CONTENTS

BACKGROUND

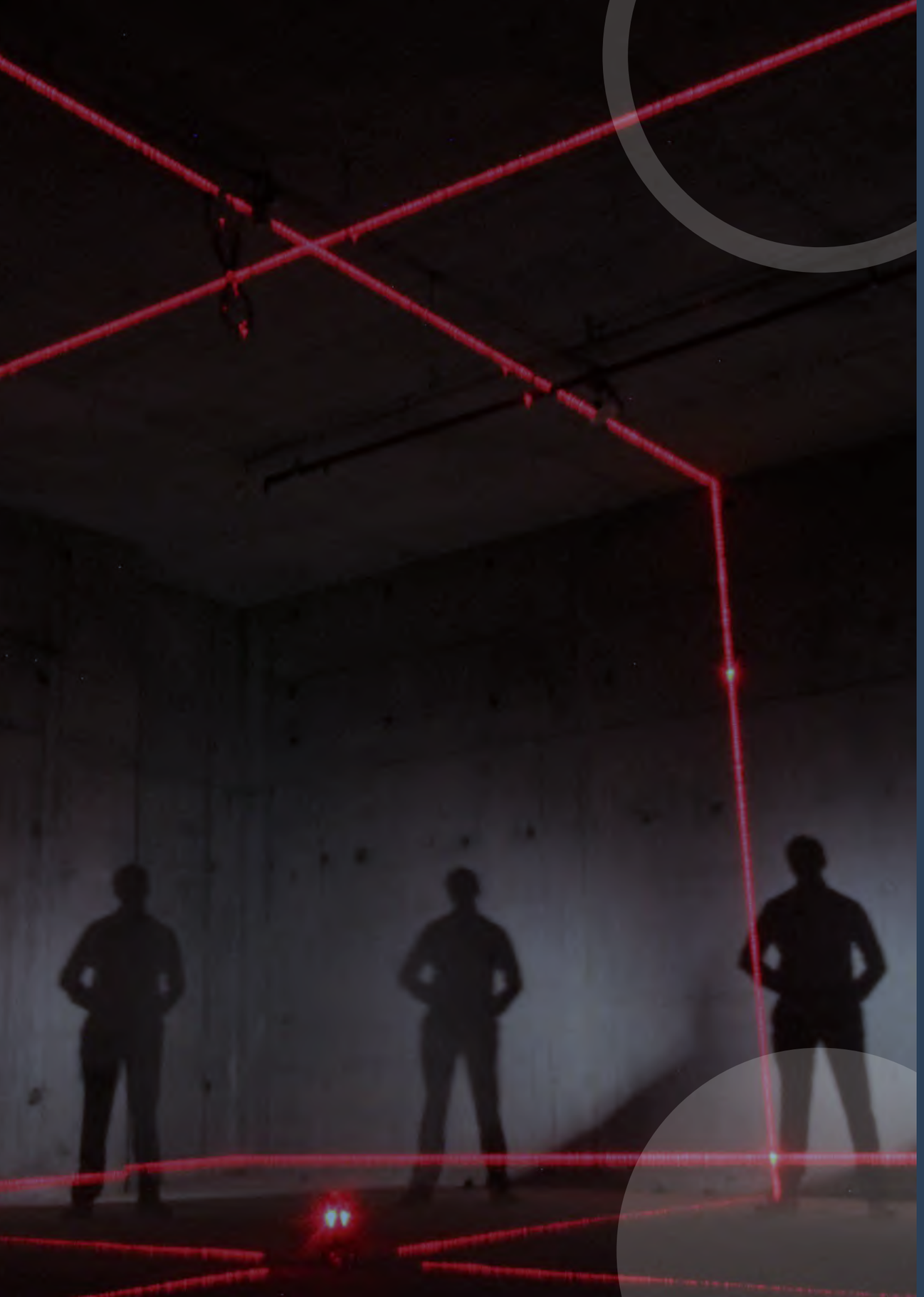
In 2019, the ACPSEM Board released a statement of expectation to the Professional Standards Board (PSB) and Radiation Oncology Certification Panel (ROCP), asking for a dynamic evidence-based Radiation Oncology Medical Physics (ROMP) Training, Education and Assessment Program (TEAP) curriculum that was flexible enough to cope with changing technology and would meet the requirements for completion of clinical training in 3 years. It was also requested that the program meet Australian Medical Council (AMC) standards, with consideration of Australian Health Practitioner Regulation Agency (AHPRA) requirements. The renewal of the ROMP TEAP officially commenced in early 2020 and has proceeded through several key phases to reach the final version.

These phases included an expert consultant desktop review of the program, incorporating an analysis of trends and identifying gaps in terms of AMC standards. It also included stakeholder consultation with targeted online questionnaires. The key items to come from this consultation were requirements for more standardised methods of assessment and a reduction in the duplication of learning outcomes. From these, there were several key recommendations generated:

- A re-structure of the Clinical Training Guide (v3.6), meeting AMC Standard 3.1
- Clearly identified program outcomes, meeting AMC Standard 2.2
- A review and update of program content, meeting AMC Standard 3.2
- Development of a model of programmatic assessment, meeting AMC Standard 5.1

To address the recommendations, expert working groups were formed and guided by craft specialists. These working groups conducted content review, defined graduate program outcome statements, and created a standardised model of assessment. These efforts have led to the creation of the ROMP TEAP Curriculum Framework and ROMP TEAP Handbook.

To those who generously contributed significant time and energy into this new structure, the ACPSEM is truly grateful. The ACPSEM also acknowledges those whose work on versions of the Clinical Training Guide developed the solid foundation that this new ROMP TEAP is built on.



TRAINING PROGRAM OVERVIEW

Training Program Summary

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THE ACPSEM ROMP TEAP CONSISTS OF SEVERAL KEY COMPONENTS:

DEGREE PROGRAM

An ACPSEM accredited postgraduate degree program in medical physics (Australian Qualification Framework level 9).

This may be completed either during or prior to enrolment in the ROMP TEAP.

If completed during, additional time will be added to the overall program length to compensate for this.

CLINICAL TRAINING

Clinical-based training and education conducted at an ACPSEM accredited training site.

This component of the ROMP TEAP is 3 years full time equivalent (FTE) in length.

EXTERNAL ASSESMENT

Successful completion of external assessment components, which include:

- Written, practical and oral examinations
- Formal presentation of research/development work at a recognised medical physics conference
- Completion of 3 Clinical and Scientific Reports

The ACPSEM ROMP TEAP is designed to produce competent, safe-to-practice ROMPs that have the skills required to work independently in a radiation oncology department. It is not expected that graduates are “expert” ROMPs after a period of only 3 years of clinical training.

PROGRAM OUTCOME STATEMENTS

The ROMP TEAP curriculum framework has been created around a series of graduate **Program Outcome Statements (POSs)** that reflect the attributes that graduates of the ROMP TEAP should display when certified, and then further develop throughout their professional careers. These POS traits have been defined under the following categories:

1. SAFETY

Works safely within the clinical environment of radiation oncology through the application of evidence-based practice and risk management in compliance with regulations

2. KNOWLEDGE

Communicates scientific knowledge effectively and demonstrates skills for the core areas of radiation oncology

3. CRITICAL THINKING/PROBLEM SOLVING

Provides sound radiation oncology medical physics guidance while exercising critical and innovative thinking, problem solving and judgement in a clinical or academic setting

4. COMMUNICATION AND TEAMWORK

Communicates and collaborates effectively within a multidisciplinary team ensuring the patient and quality of care is of primary focus

5. PATIENT FOCUSED

Practices patient centred radiation oncology medical physics with compassion and respect, using ethical and professional values

6. EDUCATOR

Provides education, training and supervision to facilitate the functions of the profession

7. CPD

Demonstrates commitment to ongoing life-long professional development and learning

Each learning outcome in the curriculum framework has links to at least one of these graduate program outcome statements (see Appendix 1), and all program outcome statements are covered across multiple learning outcomes, with the exception of CPD, as this is not currently mandatory in the ACPSEM TEAP but is mandatory once a graduate is listed on the Register of Qualified Medical Physics Specialists and Radiopharmaceutical Scientists on completion of the ROMP TEAP. At all stages, when Registrars are assessed, those performing assessment should be linking Registrar skills to these graduate program outcome statements.

Stages of Clinical Training

The clinical training component of ROMP TEAP is 3 years. This is ***in addition to*** the time required to complete any required post-graduate university study. Entry into TEAP is based on fixed eligibility criteria and selection tools, with clinical training to occur at an ACPSEM accredited training site under the management of an ACPSEM approved supervisor.

36 months FTE

There are three stages of training: Stage A (Foundation), Stage B (Core) and Stage C (Consolidation) (see Figure 1). Each stage is anticipated to take 12 months FTE, although progression between stages can occur at other times, depending on different factors.

Within each stage, there are:

Hurdle Requirements, which must be completed before the Registrar is eligible for progression

Evidence Requirements, which must be collated in each stage

Ad hoc Learning Opportunities, which are not mandatory. The ones listed in this handbook are only examples, with the expectation there will be others as determined by individual departments.

Structured Learning Activities (SLAs), which are mandatory. Many of these are specifically mapped to Learning Outcomes, and satisfactory completion of SLAs (along with any *ad hoc* learning opportunities) allows the Registrar to attain the skills stated in a Learning Outcome (LO).

Progression from Stage A to B, Stage B to C, and Stage C to completion (Certification) is a high-stakes decision by the relevant progression committee. The committee must review all submitted evidence and requirements and make an informed decision of Registrar competence.

Registrars have flexibility in the attainment of Learning Outcomes, especially in the order in which they are undertaken. This recognises the variation in training centre programs and contexts. However, Registrar progress must be monitored to ensure that clinical training can be completed in the expected timeframe. Figure 2 shows an example of possible Learning Outcome attainment in each Stage of TEAP. Whilst the specific order of training is flexible, KA1 must be completed in the first six (6) months of Stage A, and KA6 and KA9 must be fully completed during Stage B in order to become eligible to sit the written exam for these KAs.

0-12 months

STAGE A: FOUNDATION TRAINING

In this stage, most Registrars are entering the world of the health professional for the first time. As part of this, there are key induction items that must be completed to appropriately initiate Registrars around the expectations and role of the ROMP in the clinical environment. Along with relevant theoretical education, it is expected Registrars will be undertaking clinical work in this stage, however, most will require significant supervision when doing so initially. Registrars will transition to a greater level of independence in routine work and begin to play a role in departmental projects.

Stages of Clinical Training

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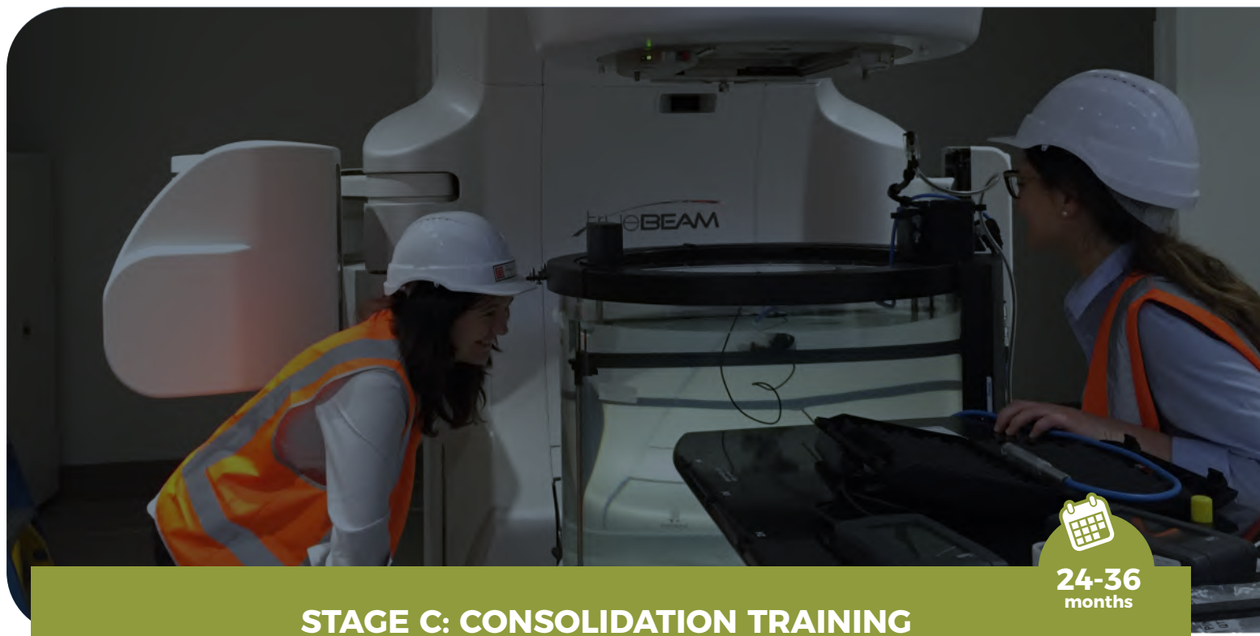
STAGE B: CORE TRAINING

9-30 months

In this stage, Registrars are beginning to gain confidence and should be able to be rostered to simple routine tasks under minimal supervision. Theoretical education in key areas (dosimetry, linear accelerators, radiation safety and treatment planning) that commenced in Stage A should be completed in this stage and will be formally assessed prior to the end of Stage B as part of the written examination. The "usefulness" of the Registrar to the department will increase during Stage B as the Registrar becomes more proficient in routine work and will learn how to lead small projects and be a functional member of larger projects.

Progression from Stage A to B, Stage B to C, and Stage C to completion (Certification) is a high-stakes decision by the relevant progression committee.



STAGE C: CONSOLIDATION TRAINING

24-36 months

In this stage, Registrars should be competent to complete tasks under general (non-direct) supervision and be able to use their knowledge to problem-solve unusual clinical scenarios. Registrars in this stage must have the ability to recognise when they are out-of-their-depth and know how/where to look for help and guidance (e.g. key best practice documents), which underpins the foundation of a safe, independent clinical medical physicist. It is during Stage C that the Registrar ultimately transitions to having the same functions and responsibilities as an ACPSEM registered medical physicist.

Registrars have flexibility in the attainment of Learning Outcomes, especially in the order in which they are undertaken.

Radiation Oncology Medical Physics (ROMP) Training Education and Assessment Program (TEAP) Summary

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Continuing Professional Development (CPD) and transition to ongoing profressional practice

Certification (or further training / remediation) (high-stakes committee decision)

Stage C: Consolidation (months 24 – 36) approx. 12-month duration

24-36 months

Stage C:

Structured Learning Activities	Multi-Source Feedback, Practical activities, Written & Oral tasks, Entrustment activities, Reflective work
***Ad hoc* Learning Opportunities**	Critical reviews of procedures, Major projects, Procedural work, QA reports
Evidence Requirements	Entrustment data, Routine evidence, Logbook, Attendance, PPR reports
Hurdle Requirements	Clinical & Scientific Report (Stage C) and oral defence, Practical and Oral exams, Conference Presentation, Post-graduate degree
Learning Outcomes	All Learning Outcomes complete

Progression (high-stakes committee decision)

Stage B: Core (months 9 – 30) approx. 12-month duration

9-30 months

Stage B:

Structured Learning Activities	Multi-Source Feedback, MCQ's Activities, Practical Activities, Written & Oral Tasks, Entrustment Activities, Reflective work
***Ad hoc* Learning Opportunities**	Non-routine QA reports, Departmental projects, Case studies, Informal discussions
Evidence Requirements	Entrustment data, Routine evidence, Logbook, Attendance, PPR reports
Hurdle Requirements	Clinical & Scientific Report (Stage B) and Written Exam
Learning Outcomes	Progress that approximates Figure 2 for Stage B

Progression (high-stakes committee decision)

Stage A: Foundation (months 0 – 12) approx. 12-month duration

0-12 months

Stage A:

Structured Learning Activities	Clinical Introduction (KA 1), MCQs Activities, Written & Oral Tasks, Enstrustment Activities, Reflective Work
***Ad hoc* Learning Opportunities**	Tutorials, Routine tasks, Q&A, Patient Case studies, Informal discussions, Literature reviews
Evidence Requirements	Entrustment data, Routine evidence, Logbook, Attendance, PPR Reports
Hurdle Requirements	Clinical & Scientific Report (Stage A)
Learning Outcomes	Progress that approximates Figure 2 for Stage A

Entry into ROMP TEAP
Eligibility criteria & selection tools

Increasing ROMP Competence

Figure 1: Diagrammatic summary of the ROMP TEAP requirements

EXAMPLE TEAP PROGRESSION PER STAGE

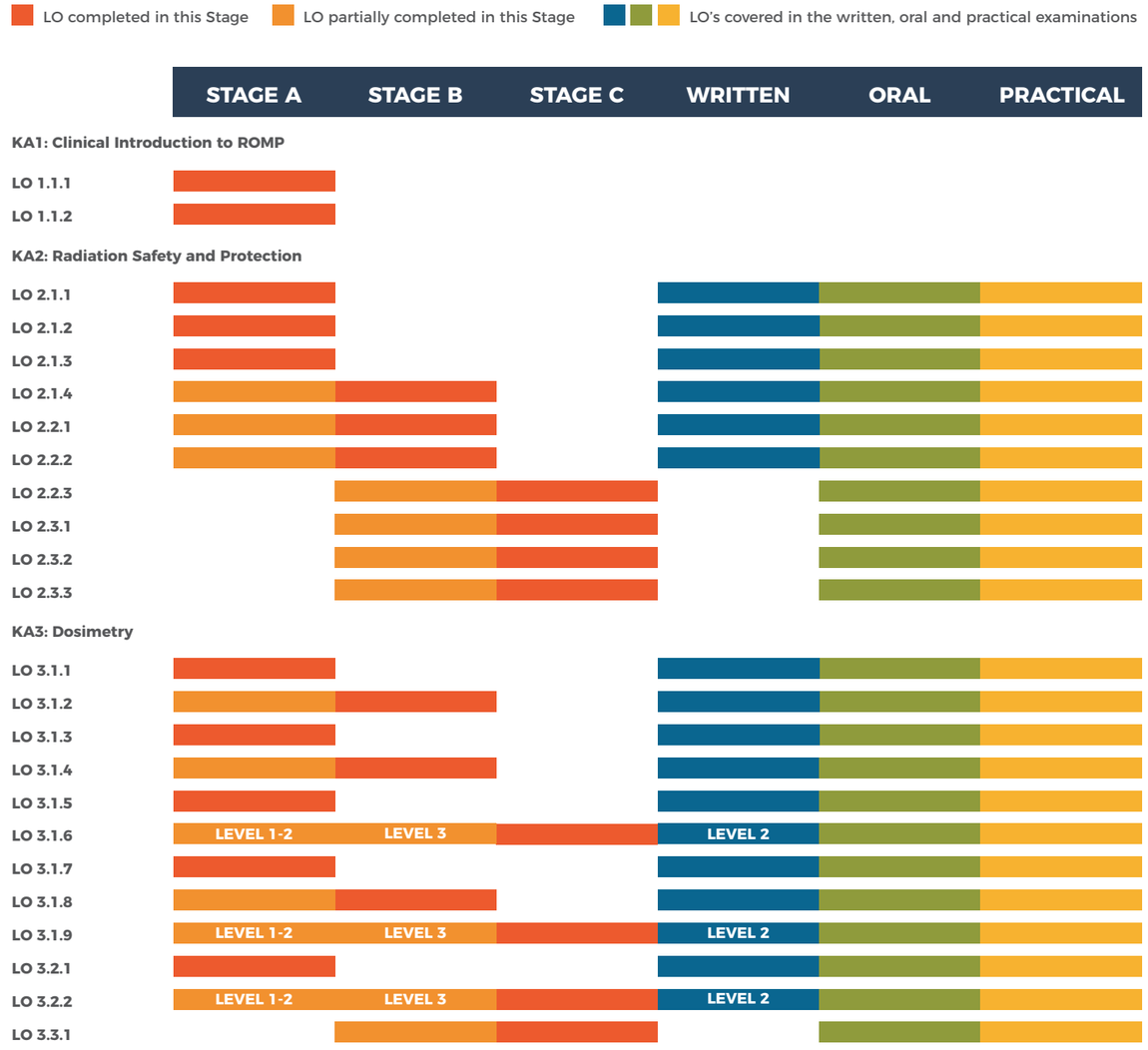

Figure 2: Example 'Density' of Learning Outcome attainment for a standard Registrar

Radiation Oncology Medical Physics (ROMP) Training Education and Assessment Program (TEAP) Summary

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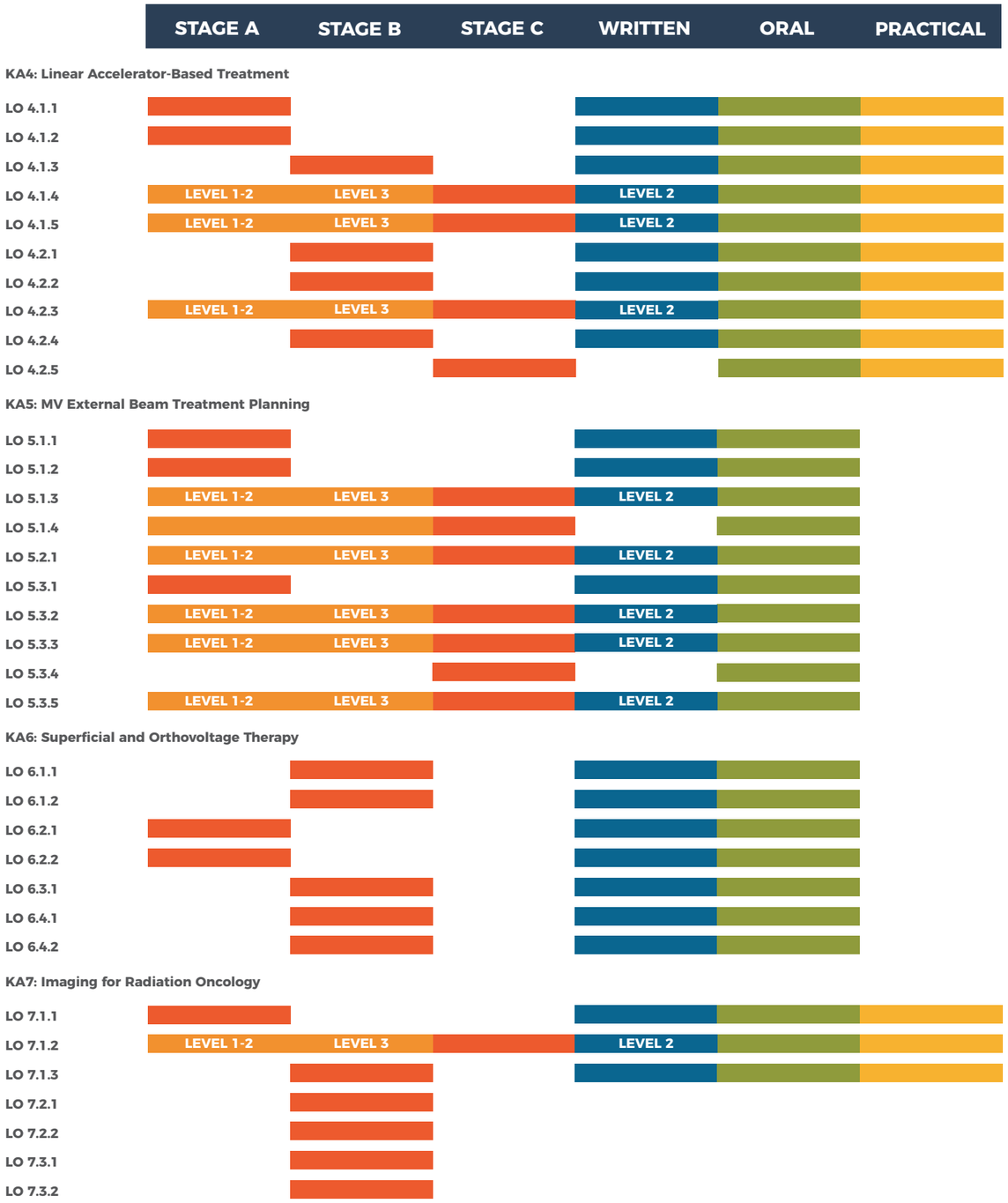
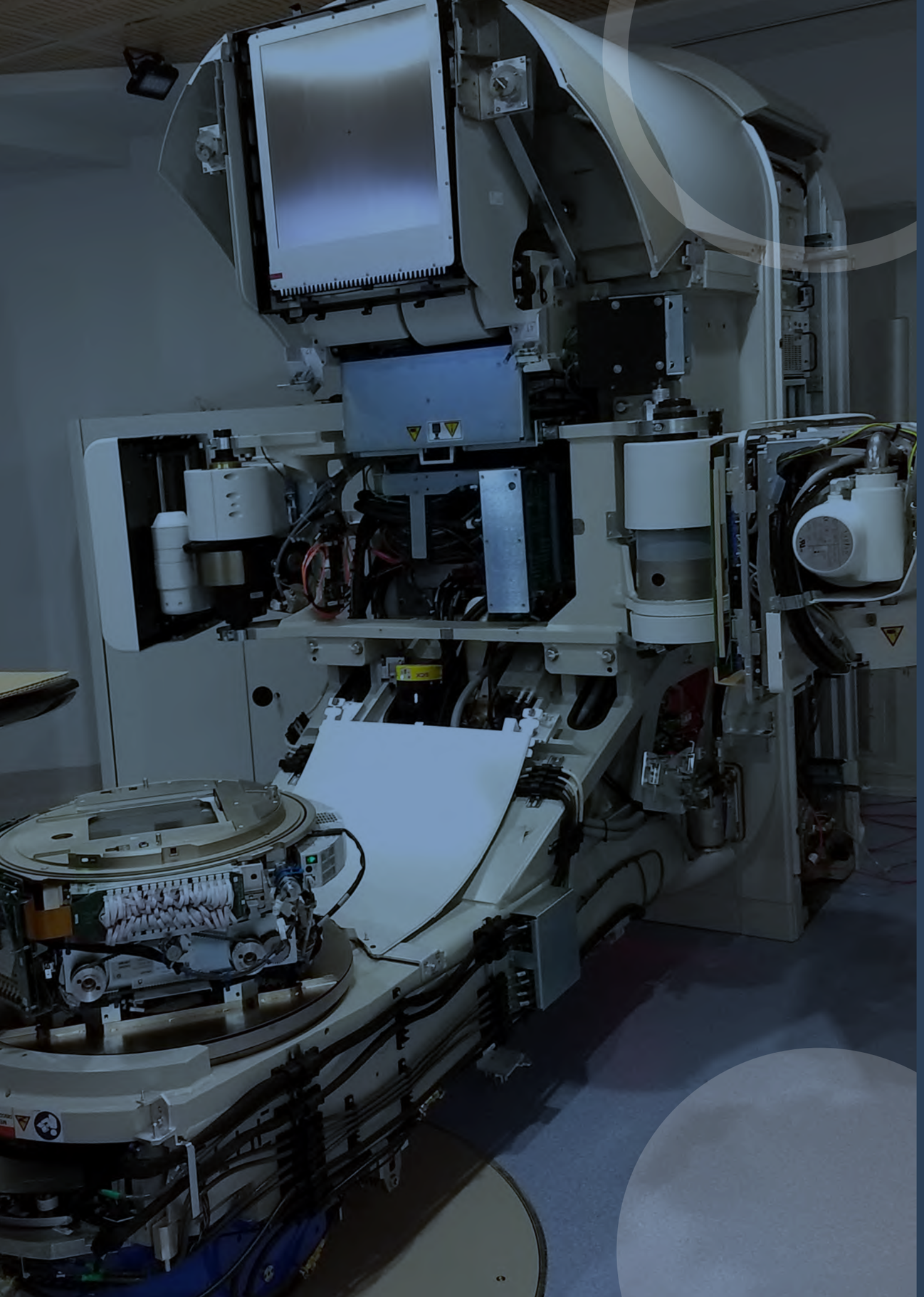


Figure 2 (cont.): Example 'Density' of Learning Outcome attainment for a standard Registrar

This figure is not prescriptive, rather it is an illustration of how training may unfold and may be helpful in guiding Registrars and Supervisors.

Figure 2 (cont.): Example 'Density' of Learning Outcome attainment for a standard Registrar



EDUCATION AND ASSESSMENT FRAMEWORK

Educational Principles

In this ROMP TEAP, the ACPSEM has targeted increased assessment standardisation, facilitating tracking of Registrar progress, and reducing any unnecessary, non-meaningful and burdensome assessment. The ACPSEM aimed to achieve this through the application of a model of programmatic assessment that applies a holistic view of performance across multiple assessment data points (see Figure 3).

This model recognises that as competency develops over time, assessment information is gathered in a progressive way, incorporating multiple assessments by multiple assessors. The new model will ensure all available information is gathered and reported to measure competence, progression, and the achievement of learning outcomes.

In **programmatic assessment,** the design and utility of the assessment program as a whole is emphasised, rather than focusing on the adequacy of individual assessments of performance (van der Vleuten & Schuwirth, 2005). This is because a program of assessment recognises that assessing complex competencies requires a range of measures and cannot be adequately learned and assessed through single assessments (van der Vleuten, Heeneman & Schuwirth, 2017).

Conceptualising assessment in this way means that a range of assessments purposefully selected may comprise a program, including those usually considered less standardised or less reliable, because these assessments fulfil a clear purpose in the overall program. Each individual assessment datapoint contributes to the evidence base for determining competence. Progression decisions are not made solely on the bases of one assessment instrument (such as an exam). Instead, **accumulated evidence** is reviewed by a committee of experts for decision-making purposes when there is enough evidence on the learner to inform robust decisions (van der Vleuten et al., 2015).

In the ROMP TEAP, many of the designed structured learning activities will also generate assessment evidence. This is because a programmatic approach to assessment emphasises **the fundamental role of feedback** in directing student learning. All assessment data points should provide an opportunity for learning as effective feedback is critical to the success of any programmatic approach (van der Vleuten et al., 2015).

Although programmatic assessment approaches have become highly regarded in health profession education, the philosophy of such approaches contrasts significantly with traditional summative, mastery-based approaches to assessment and learning. The substantial shift in orientation required to embed a programmatic assessment approach means that implementation is often challenging (van der Vleuten, 2016; Pearce & Prideaux, 2019).

IN SUMMARY

The traditional formative/summative dichotomy is replaced with a continuum of stakes, from low- to high-stakes. This requires a shift in thinking for those who may be accustomed to a traditional assessment approach. Each individual assessment datapoint contributes to the evidence base for determining competence. Accumulated evidence is reviewed by expert judges for decision-making purposes.

Programmatic assessment removes pass/fail decisions from single assessment moments. Instead, rich assessment information is gathered on candidates using a wide variety of tools. These data in combination should provide a longitudinal profile on the learner's development (Heeneman et al., 2015).

From a decision-making perspective, gathering rich assessment information across formats provides a clearer picture of candidate performance and enhances the "trustworthiness and defensibility" of decisions.

REGISTRARS

High-stakes decisions (such as progression between stages) should be based on review of rich evidence of performance. For this to occur, Registrars must ensure that they are regularly uploading evidence to the dedicated learning management system. High quality evidence should facilitate a straightforward decision by the committee.

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Key recommendations in the decision to move towards programmatic assessment include:

- Building a culture of promoting high-quality feedback for learning through ongoing training, support, and engagement with all stakeholders
- Supporting a process of mentoring Registrars through TEAP and allowing personalised remediation for Registrars experiencing difficulty
- Iteratively enhancing and continuously improving this training handbook and all assessment resources, enabling adaptations based on feedback from stakeholders

A programmatic approach requires support for Supervisors to provide high-quality feedback and for Registrars to use feedback effectively for learning. The process requires effective communication between the different groups involved to ensure that the system operates as intended and to identify any difficulties in the process (van der Vleuten et al., 2015).

References

Heeneman, S., Oudkerk Pool, A., Schuwirth, L. W., van der Vleuten, C. P., & Driessen, E. W. (2015). The impact of programmatic assessment on student learning: theory versus practice. Medical Education, 49(5), 487-498.

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van der Vleuten, C., Heeneman, S., & Schuwirth, L. (2017). Programmatic assessment (pp. 295–303). In Dent, J., Harden, R. M., & Hunt, D. (Eds.). A practical guide for medical teachers. Elsevier health sciences.

Pearce, J., & Prideaux, D. (2019). When I say... programmatic assessment in postgraduate medical education. Medical Education, 53(11), 1074-1076.

Lower stakes assessments occur more frequently in the program and are designed as both an assessment and a teaching tool to enable rich feedback to the Registrar on their progress.

PROGRAMMATIC ASSESSMENT EVIDENTIARY FRAMEWORK

In programmatic assessment, each individual assessment datapoint contributes to the evidence base for determining competence, with a continuum of stakes across both the assessment and learning activities. High-stakes “hurdle” requirements are designed with measures in place to determine the minimum acceptable standard for each particular singular assessment point. Lower stakes assessments occur more frequently in the program and are designed as both an assessment and a teaching tool to enable rich feedback to the Registrar on their progress. These lower stakes assessments are an integral part of the mandatory structured learning activities and can also be applied to ad hoc learning activities in a similar way. Completion of these assessments can form key sources of training evidence.

Evidence can be generated from the following datapoints:

- Both higher stakes hurdle requirements and lower stakes evidentiary requirements
- Learning activities, both mandatory structured activities and non-mandatory ad hoc learning opportunities (of which those listed are only examples).

Accumulated evidence is then reviewed by expert committees when making high-stakes decisions (i.e., progression, certification).

Educational Principles

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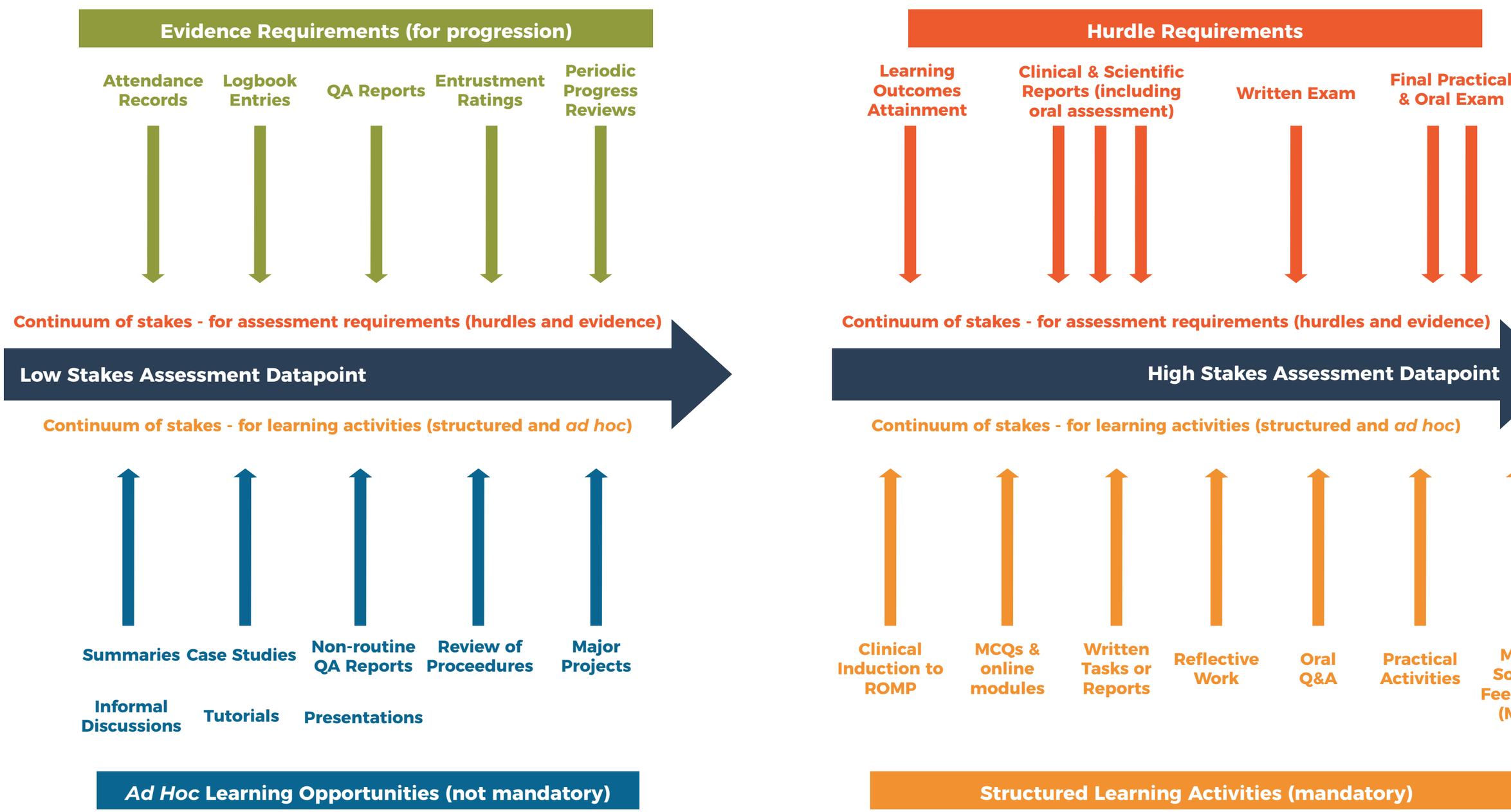
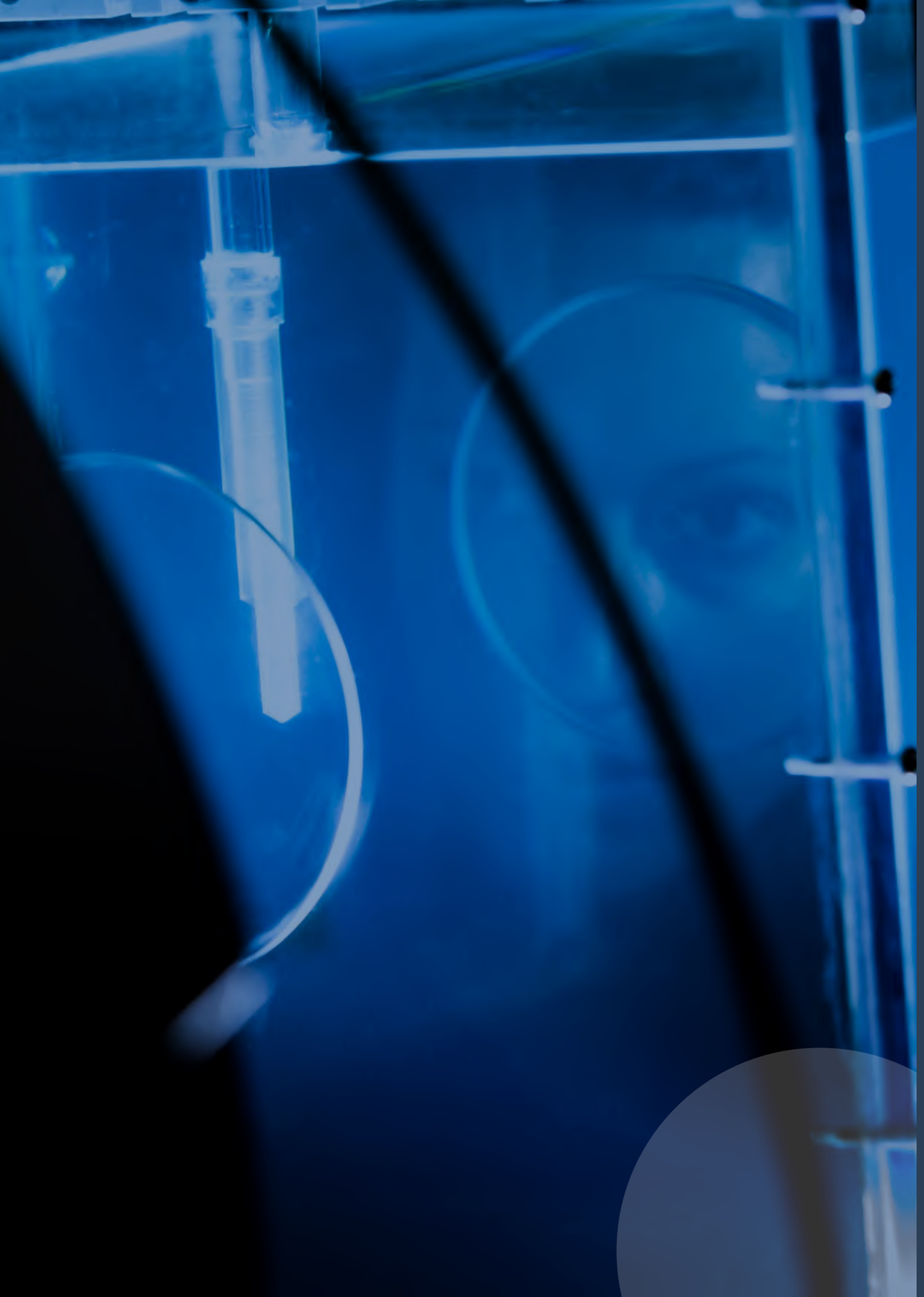
ROMP Programmatic Assessment Evidentiary Framework





STRUCTURED LEARNING ACTIVITIES AND ASSESSMENT METHODS

Structured Learning Activities and Assesment Methods

In designing the ROMP TEAP programmatic assessment model, many assessment methods were considered. Some of the resulting core assessment methods can also be considered as structured learning activities (SLAs), and their definitions, are provided below:

Multiple Choice Question (MCQ) Activity, which may be an online set of questions or routine quiz.

Written Task or Report, which may be an educational report or project-based clinical report

Oral Assessment, which may be with a supervisor or assessor, and take the form of a series of structured oral questions with specific prompts and follow-up probing questions.

Practical Activity, which is generally a specific practical task, potentially observed and timed, or set by a supervisor or assessor and then results reviewed. It will tend to only be completed once or twice during the course of the training program.

Entrustment Activity, which may be routine (day-to-day) work that maps to a LO, and the supervisor (or other assessor) uses the Entrustment Scale to rate the Registrar's level of entrustment. Repeat ratings should be recorded to show improvement over time.

There are specific assessment methods assigned to each learning outcome in the Curriculum Framework (see Appendix 2) . Each learning outcome should be assessed by the clinical training department using the methodology assigned unless there is a clear justification as to why an alternate assessment method should be used. For departments with pre-existing robust training and assessment models, these may continue to be used if approval is given from the ACPSEM Coordinators.

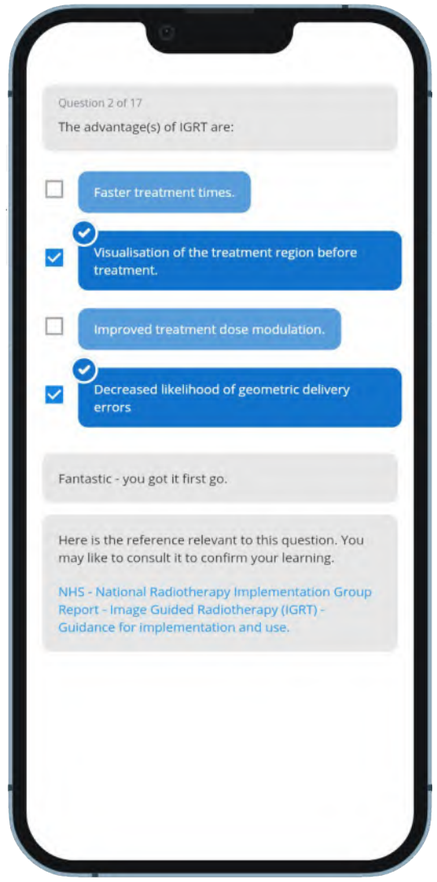
Multiple Choice Question (MCQ) Activities

Multiple Choice Questions (MCQs) come in many forms, such as single-best answer and longer option versions such as extended-matching questions. These item types typically have a list of options for a candidate to select. There is one correct option and several incorrect options, called "distractors". These questions do not require detailed assessment rubrics, can be machine/computer scored, and offer the advantage of collecting multiple data points in relatively short time frames.

A disadvantage is that these item types are prone to cueing, or prompting the answer through the question, and are often not very authentic to clinical practice or able to address a wide scope of learning.

Significant work has been done by the ACPSEM and the Radiation Oncology Certification Panel (ROCP) over recent years in this space, including engaging craft experts in the art and science of MCQ development. There is an existing bank of questions that have been used for formative purposes, with some mapped to the Clinical Training Guide (CTG) v3.6 "Level 1". These MCQs will be repurposed within the new curriculum.

It is acknowledged that further development work is required, as MCQ activities (which may be online sets of questions or routine quizzes) are proposed as a significant part of the attainment of Learning Outcomes in the revised program.



Structured Learning Activities and Assesment Methods

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Written Tasks or Reports

Reports can be a useful form of assessment, but clear instructions on the purpose and scope of each report is required, so that Registrars understand what is expected of them in the report. Written tasks require detailed rubrics to allow for valid, consistent, and defensible assessment.

Written tasks or reports can be split into 2 distinct categories:

1. **Educational reports**
2. **Project-based clinical reports**

Educational Reports

These reports are a demonstration by the Registrar that they have gained the appropriate knowledge required for the learning outcome. They should be written in such a way that a reader could also learn the knowledge. The word limit should be 1000 words per Element, so that the Registrar can practice concise description and so that the marking is not too onerous for the Supervisor. The Supervisor can follow the general Educational Report Assessment Rubric.

Alternative to a written report, the Registrar may present this report as a PowerPoint presentation. The Supervisor will use the same assessment criteria and rubric in this case. Benefits to this style could be teaching other Registrars content simultaneously or simpler presentation/grading if the Registrar Supervisor prefer verbal communication.

Educational Report Assessment Rubric

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Knowledge of clinical medical physics principles	• Demonstrates an understanding of most theory, but some weaknesses still present • Demonstrates a limited understanding of how the theory is used to guide clinical practice - questions need to be asked by the Supervisor	• Demonstrates a strong understanding of relevant theory • Independently demonstrates an understanding of how the theory is used to guide clinical practice	• Demonstrates an extensive knowledge of theoretical concepts • Uses innovative thinking to suggest improvements to clinical practice
Possesses high-quality written scientific communicationskills	• Unable to clearly demonstrate sound communication skills • Questions are required by the Supervisor to clarify the meaning of some text • Uses a noticeable amount of informal, non-scientific language • Uses local terminology that would make it difficult for an external reader to understand	• Demonstrates sound scientific communication with only minor deficiencies. • Demonstrates mostly well written, formal, and logical written scientific communication • Demonstrates the ability to write for an external audience (e.g., a Medical Physicist from a different department), by using general scientific terms	• Demonstrates proficiency in scientific communication with no deficiencies. • Demonstrates very well written, formal, and logical written scientific communication • Demonstrates the ability to create a written report that could be used as a reference by an external audience (e.g. a Medical Physicist from a different department)

When applicable (e.g. Element involves a completed task):

Application of relevant theory to clinical situations	• Demonstrates only a basic understanding of why tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed • Demonstrates the ability to discuss non-routine processes with the supervisor	• Demonstrates the ability to critique routine procedures • Demonstrates the ability to describe non-routine processes independently

Project-based Clinical Reports

These reports provide the details of clinical projects that the Registrar has performed in the department. It is likely that the Registrar will produce an internal report for this work. The Registrar may start with an internal report and add additional education sections (e.g. critical reflection, clinical importance and more detailed theory). Alternatively, the Registrar may use the suggested format as described for the entire report. The word limit should be 5000-6000 words, so that the Registrar can practice concise descriptions and so that the marking is not too onerous for the Supervisor. This can be varied depending on the format of the department's internal reports.

Project-based clinical report structure and assessment

During this learning outcome is important that the Registrar displays the following key skills:

- demonstrates critical and thorough scientific thinking
- possesses high-quality written scientific communication skills
- reflects upon the impact of their work in context
- demonstrates independent decision-making
- demonstrates competent scientific practice

The Registrar should demonstrate that they have a thorough understanding of the project, its impact, its limitations, and their performance.

The Registrar may do a small project independently or show some example of independence or leadership as part of a larger team during a major project. The project should be of sufficient substance for the Registrar to be able to clearly demonstrate the required key skills and assessment criteria (see rubric) of this learning outcome.

The Registrar must have ownership of the project and be clearly identifiable as the primary author. It is not expected that the Registrar be fully independent when performing the project (although it is encouraged where possible). When senior staff are called upon by the Registrar to assist them during the project, they should act as a mentor. The senior staff member must not "take over" the project.

The Registrar will be assessed by written report as detailed below. The project should be identified as a suitable for this learning outcome before it commences, and the report should be written during or on completion of the project.

The assessed report should include the following sections:

INTRODUCTION AND LITERATURE REVIEW

Here the Registrar will describe what the project is and why it is needed to be performed. Any background theory the reader requires to understand the work should also be included. A large part of the introduction will be a review of the literature. The literature review should be thorough and leave the reader in no doubt that the Registrar has extensive knowledge on the subject. In some cases, the Registrar's department may have a well written internal procedure. For this learning outcome, the Registrar should still perform an independent literature review and contrast the internal document to other literature. The independent literature review may either improve the internal document or verify its quality.

METHODS

The methodology may be written differently depending on the style of project the Registrar is doing for the learning outcome. In all cases the Registrar should write the methodology with sufficient detail so that the reader could reproduce the work. It is advisable to get a peer who is not familiar with the work to review the methods to determine this.

RESULTS

The results section should follow logically from the methods. Often, the sub-sections of the results section are same as the method section. The results should be written clearly and objectively. They should contain no additional methods and no extensive discussion (this will be in the discussion section), other than succinctly highlighting the more noteworthy findings. The Registrar should demonstrate that they have correctly estimated the uncertainty involved in their results. Statements such as "the results were in close agreement" must be avoided in favour of quantitative uncertainty analysis.

Structured Learning Activities and Assesment Methods

CRITICAL DISCUSSION

In the discussion section the Registrar should detail all the important findings of the work. They will compare and contrast their results to the literature and (if relevant) to previous departmental results. The Registrar will also discuss the limitations.

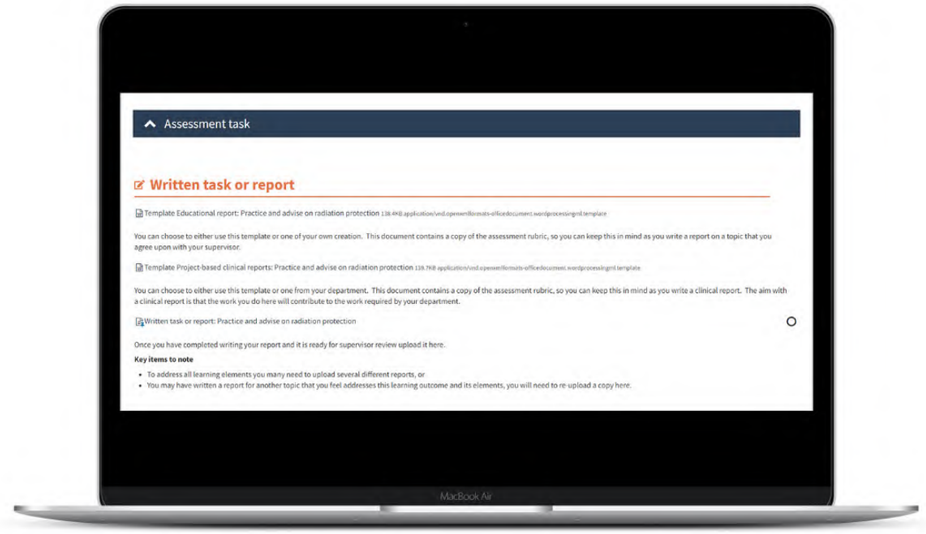
CLINICAL IMPORTANCE

In this section the Registrar will demonstrate that they have an understanding of the project in the context of their role as a ROMP. Changes to existing procedures that the Registrar recommends based on their project work should be described. The Registrar should reflect on why the new procedure or knowledge will benefit patients and/or the department. If the Registrar is not recommending any changes to an existing procedure, then they must justify this decision.

This section is particularly important for Registrars who choose standard clinical projects that have expected results (within tolerance). In these cases, the Registrar must use this section to detail why tests are important for patient care, and the consequences to patients if the test results had been out of tolerance. Broader implications of the project in a wider clinical context should also be considered.

CRITICAL REFLECTION

The Registrar should write in their own words how things could be performed better if they were to do the project again. It is highly unlikely that any project ran perfectly, and the Registrar should reflect on all aspects of the project including (but not limited to): project planning, communication, time management, experimental procedure, the role of other staff members (e.g. did you need to do all the work, or could more have been delegated?), and so on.



Project-based Clinical Report Assessment

This learning outcome should be marked against the assessment criteria using the rubric provided. Once the report is graded the Registrar should be provided with feedback. It is recommended that any substantial feedback is discussed orally.

Critical (but helpful) feedback is very useful as a learning tool. Even reports receiving grades of “Meets expectations” or “Exceeds expectations” will still require minor improvements. Once the improvements are made, the learning outcome can be graded as complete.

Grades of “Falls short of expectations” are likely to require major improvements and the feedback should be provided orally to ensure there is clarity around expectations.

Note that further oral discussion may be had at any point during the feedback process.

Project-based Clinical Report Assessment Rubric

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Demonstrates critical and thorough scientific thinking	• Demonstrates an understanding of most theory, but some weaknesses still present • Demonstrates a limited understanding of how the theory is used to guide clinical practice - questions need to be asked by the Supervisor • Unable to demonstrate justification of procedures and/or equipment	• Demonstrates a strong understanding of relevant theory • Independently demonstrates an understanding of how the theory is used to guide clinical practice • Demonstrates sound justification of all procedures and equipment	• Demonstrates an extensive knowledge of theoretical concepts • Uses innovative thinking to suggest improvements to clinical practice • Demonstrates sound justification of all procedures and equipment and demonstrates justification of some innovative procedures and/or novel equipment
Possesses high-quality written scientific communicationskills	• Unable to clearly demonstrate sound communication skills • Questions are required by the Supervisor to clarify the meaning of some text • Uses a noticeable amount of informal, non-scientific language. • Uses local terminology that would make it difficult for an external reader to understand	• Demonstrates sound scientific communication with only minor deficiencies • Demonstrates mostly well written, formal, and logical written scientific communication • Demonstrates the ability to write for an external audience (e.g., a Medical Physicist from a different department), by using general scientific terms	• Demonstrates proficiency in scientific communication with no deficiencies • Demonstrates very well written, formal, and logical written scientific communication • Demonstrates the ability to create a written report that could be used as a reference by an external audience (e.g. a Medical Physicist from a different department)
Reflects upon the impact of their work in context	• Some content as described in clinical importance and critical discussion sections absent or does not meet an acceptable standard	• Covers all content as described in the clinical importance and critical discussion sections to an acceptable standard	• Covers all content as described in clinical importance and critical discussion sections to a high standard
Demonstrates independent decision-making	• Unable to demonstrate the ability to make clinical recommendations - no clear clinical decisions arise from the report • Unable to demonstrate the ability to provide implementation advice - it is left to the Supervisor to determine how the work is implemented	• Demonstrates the ability to make clinical recommendations, which may have been discussed with the Supervisor • Demonstrates the ability to provide advice on the clinical implementation of the work.	• Demonstrates the ability to make important clinical recommendations, which the Registrar has thought through independently • Demonstrates the ability to suggest improvements to clinical practice based on the work
Demonstrates competent scientific practice	• Some content as described in methods and results sections absent or does not meet an acceptable standard.	• Covers all content as described in methods and results sections to an acceptable standard.	• Covers all content as described in methods and results sections to a high standard.

Oral Assessments

In oral assessment, candidates are typically asked to verbally respond to a series of questions. These forms of assessment are opportunities for assessors to ask more detailed, nuanced, and challenging questions that more thoroughly assess competency and allow for discussion on areas where additional learning may be required. Oral assessment needs to be structured so that Registrars have similar experiences to ensure consistency and fairness. Inconsistency arises when assessors ask only some questions of some Registrars, or when they engage in excessive prompting. The ability to instigate verbal prompts is a strength of this format, in that assessors can probe a Registrar's knowledge or skills. However, probing should not involve leading or ambiguous questions that may result in the Registrar and Supervisor guessing what the other is wanting to hear.

Structured rubrics and a series of structured questions can enhance the consistency of oral assessment. This can ensure all Registrars are asked the same questions. Clarifying questions are permitted, such as, "Can you be more specific?" or "Can you tell me more?", but the objective is to not deviate too far from the question script. Follow-up probing questions are another a strength of the format and allow assessors to "dig deeper" and ensure understanding of important concepts. The teaching value of an oral assessment is high, as it allows real-time, meaningful feedback and discussion on specific areas that a Registrar may need additional support in.

Oral Assessment Rubric

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Knowledge of clinical medical physics principles	• Demonstrates an understanding of most theory, but some weaknesses still present • Demonstrates an understanding of how the theory is used to guide clinical practice, but still needs prompts from Supervisor	• Demonstrates a strong understanding of relevant theory • Independently demonstrates an understanding of how the theory is used to guide clinical practice	• Demonstrates an extensive knowledge of theoretical concepts • Uses innovative thinking to suggest improvements to clinical practice
Communication	• Unable to clearly demonstrate sound communication skills • Questions required by Supervisor to clarify the meaning of some answers	• Demonstrates sound scientific communication with only minor deficiencies. Mostly confident, articulate, and logical oral scientific communication	• Demonstrates proficiency in scientific communication with no deficiencies. Very confident, articulate, and logical oral scientific communication

When applicable (e.g. element involves a completed task):

Application of relevant theory to clinical situations	• Demonstrates only a basic understanding of why tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed • Demonstrates the ability to discuss non-routine processes with the supervisor	• Demonstrates the ability to critique routine procedures • Demonstrates the ability to describe non-routine processes independently

Practical Activities

Medical physics is a discipline that requires the mastery of many practical skills, which should be assessed in a form that closely resembles the authentic task. Practical assessment activities should be structured, with the task needing to be achievable
in a set duration. Consideration needs to be given to whether the Registrar is familiar with the equipment that they are using for the task.

Assessment of practical skills should ideally not be in contrived contexts. Instead, tasks should be designed that replicate the scenario in which the task is required. The practical activity can then be a formalised assessment that goes through the scenario and allows the Registrar to troubleshoot novel situations. A Practical Activity differs from an Entrustment Activity with the consideration that a practical activity might only be performed once or twice over the entire course of the ROMP TEAP (e.g. a linac bunker survey). As such, the activity and its associated assessment may be considered “bespoke”. The Practical Activity Assessment Rubric may be used as a general guide and modified by the Supervisor to create a custom, fit-for-purpose assessment rubric for the specific learning outcome.

Practical Activity Assessment Rubric

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Ability to perform practical tasks	• Demonstrates proficiency in practical tasks but still requires some indirect supervision • Demonstrates ability to independently perform practical tasks, however with some deficiencies such as taking excessive time, asking the supervisor about some routine tasks	• Demonstrates ability to independently perform practical tasks concisely and to a high standard • Demonstrates independent proficiency in practical tasks	• Demonstrates independent proficiency in practical tasks and may be trusted to supervise new Registrars
Clinical medical physics judgment and responsibility	• Cannot demonstrate the ability discuss the clinical importance of results without heavy guidance from the supervisor • Demonstrates the ability to flag unusual results with supervisor, but discussions about these are supervisor-led • Demonstrates poor clinical judgment in routine work	• Demonstrates the ability to independently discuss the clinical importance of the results • Demonstrates the ability to flag and hold a Registrar-led discussion about unusual results with supervisor	• Demonstrates thorough and independent clinical judgment in both routine work and non-routine results
Demonstrates critical and thorough scientific thinking	• Demonstrates an understanding of most theory, but some weaknesses still present • Demonstrates the ability to use theory to guide clinical practice, but needs guidance from supervisor • Unable to demonstrate justification of procedures and/or equipment	• Demonstrates a strong understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice independently • Demonstrates sound justification of all procedures and equipment	• Demonstrates an extensive knowledge of theoretical concepts • Uses innovative thinking to suggest improvements to clinical practice • Demonstrates sound justification of all procedures and equipment and demonstrates justification of some innovative procedures and/or novel equipment
Application of relevant theory to clinical situations	• Demonstrates only a basic understanding of why tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed	• Demonstrates the ability to critique routine procedures

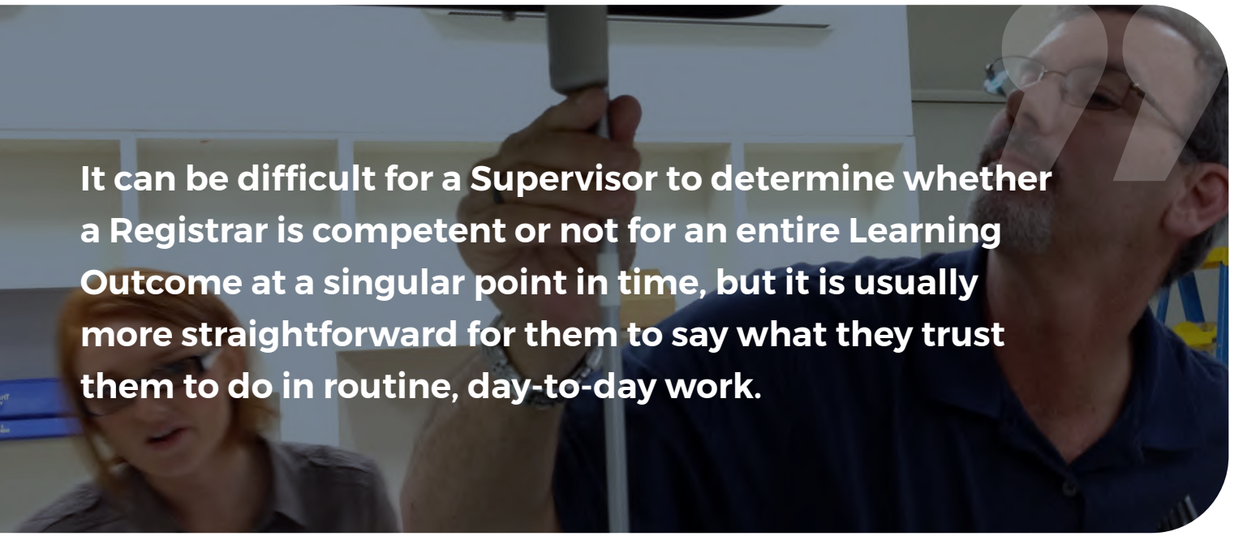
Structured Learning Activities and Assesment Methods

Entrustment Activities

Entrustment scales provide an incentive-based, but safe approach to monitoring increased competence. It also introduces the concept of trust to assessment. The approach involves the expected progression by the Registrar through several levels of increasingly independent practice, until the Registrar is deemed to be competent to perform a task independently. It can be difficult for a Supervisor to determine whether a Registrar is competent or not for an entire Learning Outcome at a singular point in time, but it is usually more straightforward for them to say what they trust them to do in routine, day-to-day work. By recording their level of entrustment over time (through repeated and ongoing ratings), increased proficiency is monitored.

An Entrustment Rating Scale was developed by the ACPSEM in collaboration with the Australian Council for Educational Research (ACER). This scale is unique to the ROMP TEAP context. The level of entrustment is captured in the “Behavioural Domain”, which describes the level of supervision required at each level of the rating scale. The “Cognitive Domain” describes the corresponding expected level of Registrar cognitive ability. Some Learning Outcomes are mapped to Entrustment Activities and the rating scale should be used for those activities.

Additional criteria for an individual activity may need to be developed to ensure the scale is fit-for-purpose.



Entrustment ratings may be informed by routine evidence. Routine evidence is information generated from routine (day-to-day) work. Examples may be logs from routine quality assurance work, written communications/emails/memos, etc.

The ROMP Entrustment Scale should be used to help guide the Supervisor in determining the level of entrustment. There are 2 different presentations of the Entrustment Rating Scale rubrics provided. Both provide identical information but are structured in different ways:

- By assessment criteria sections
- By entrustment level sections

The first presentation may be more beneficial if focussing on a singular criterion, while the second may be more useful for holistically judging a level. Both may be used interchangeably at the discretion of the Supervisor.

OVERALL ENTRUSTMENT RATING SCALE FOR ROMP TEAP

	LEVEL 1 Constant Direct Supervision	LEVEL 2 Direct Supervision	LEVEL 3 Minimal Direct Supervision	LEVEL 4 Direct Supervision Not Required
Behavioural Domain	Supervisor (or equivalent) is directly observing Registrar’s work	Supervisor is immediately available, and needs to review Registrar’s work periodically	Supervisor is readily available and needs to check Registrar’s work before completion	Supervisor is available and Registrar work is checked in the same manner as a qualified ROMP
Cognitive Domain	Registrar can engage with the supervsior about why tests are performed	Registrar can explain why tests are performed	Registrar can troubleshoot non-routine results with support from supervisor	Registrar can troubleshoot non-routine results independently, and critique procedures

Structured Learning Activities and Assesment Methods

ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine

ENTRUSTMENT RATING SCALE BY ASSESSMENT CRITERIA

Ability to perform practical tasks

Behavioural Domain

ENTRUSTMENT LEVEL	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
1 - Constant Direct Supervision Supervisor (or equivalent) is directly observing Registrar's work	• Demonstrates an understanding of how to perform only some of the practical tasks • Demonstrates only some ability to perform practical tasks even under constant supervision	• Demonstrates an understanding of how to perform the practical tasks • Demonstrates ability to perform practical tasks but still requires constant supervision • Demonstrates a lack of proficiency in practical tasks and must be constantly supervised	• Demonstrates an impressive understanding of how to perform basic practical tasks • Demonstrates ability to perform practical tasks with minimal input from supervisor • Demonstrates proficiency in practical tasks but still requires some indirect supervision
2 - Direct Supervision Supervisor is immediately available, and needs to review	• Demonstrates ability to perform practical tasks but still requires supervisor present at all times • Demonstrates a lack of proficiency in practical tasks and must be constantly supervised	• Demonstrates ability to perform practical tasks without constant supervision • Demonstrates proficiency in practical tasks with some prompting by supervisor	• Demonstrates ability to perform practical tasks concisely without constant supervision • Demonstrates independent proficiency in all practical tasks
3 - Minimal Direct Supervision Supervisor is readily available and needs to check Registrar's work before completion	• Demonstrates ability to perform most practical tasks, however consultation with supervisor is frequent or long • Demonstrates proficiency in most practical tasks with, however supervisor-initiated prompting is required.	• Demonstrates ability to perform practical tasks with occasional consultation • Demonstrates proficiency in practical tasks with Registrar-initiated consultation with the supervisor	• Demonstrates ability to perform practical tasks concisely and to a high standard with minimal supervisor consultation • Demonstrates independent proficiency in practical tasks
4 - Direct Supervision Not Required Supervisor is available and Registrar work is checked in the same manner as a qualified ROMP	• Demonstrates proficiency in practical tasks but still requires some indirect supervision • Demonstrates ability to independently perform practical tasks, however with some deficiencies such as taking excessive time, asking the supervisor about some routine tasks	• Demonstrates ability to independently perform practical tasks concisely and to a high standard • Demonstrates independent proficiency in practical tasks	Demonstrates independent proficiency in practical tasks and may be trusted to supervise new registrars

ENTRUSTMENT RATING SCALE BY ASSESSMENT CRITERIA

Clinical medical physics judgment and responsibility

Behavioural Domain

ENTRUSTMENT LEVEL	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
1 - Constant Direct Supervision Supervisor (or equivalent) is directly observing Registrar's work	• Demonstrates limited appreciation of the role of clinical judgment in routine work	• Demonstrates an appreciation of the role of clinical judgment in routine work	• Demonstrates sound clinical judgment in routine work • Demonstrates the ability to flag unusual results with supervisor
2 - Direct Supervision Supervisor is immediately available, and needs to review	• Demonstrates limited appreciation of the meaning of the results • Cannot demonstrate the ability to flag unusual results with supervisor	• Demonstrates the ability to take part in a supervisor-led discussion on the clinical importance of the results • Demonstrates the ability to flag unusual results with supervisor	• Demonstrates the ability to independently discuss the clinical importance of the results • Demonstrates the ability to flag and hold a Registrar-led discussion about unusual results with supervisor
3 - Minimal Direct Supervision Supervisor is readily available and needs to check Registrar's work before completion	• Cannot demonstrate the ability discuss the clinical importance of results without heavy guidance from the supervisor • Demonstrates the ability to flag unusual results with supervisor, but discussions about these are supervisor-led • Demonstrates poor clinical judgment in routine work • Cannot demonstrate any responsibility for routine work	• Demonstrates the ability to independently discuss the clinical importance of the results • Demonstrates the ability to flag and hold a Registrar-led discussion about unusual results with supervisor. • Has shared responsibility for routine work, but is not independent	• Demonstrates thorough and independent clinical judgment in both routine and non-routine work • Demonstrates some independent responsibility for routine work
4 - Direct Supervision Not Required Supervisor is available and Registrar work is checked in the same manner as a qualified ROMP	• Demonstrates sound clinical judgment but only in routine results. • Has shared responsibility for routine work, but is not independent	• Demonstrates thorough and independent clinical judgment in both routine and non-routine results • Demonstrates some responsibility for routine work	• Demonstrates thorough and independent clinical judgment in, and innovative approaches to, routine and non-routine work • Demonstrated ability to adequately manage routine work

Structured Learning Activities and Assesment Methods

Australasian College of Physical Scientists & Engineers in Medicine

ENTRUSTMENT RATING SCALE BY ASSESSMENT CRITERIA

Knowledge of clinical medical physics principles

Cognitive Domain

ENTRUSTMENT LEVEL	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
1 - Constant Direct Supervision Registrar can engage with the supervsior about why tests are performed	• Demonstrates some gaps in knowledge of basic physics principles	• Demonstrates the ability to explain basic physics principles	• Demonstrates a good understanding of most relevant theory
2 - Direct Supervision Registrar can explain why tests are performed	• Demonstrates some gaps acquisition of relevant theory	• Demonstrates the acquisition of most relevant theory	• Demonstrates a strong understanding of all relevant theory
3 - Minimal Direct Supervision Registrar can troubleshoot non-routine results with support from supervisor	• Demonstrates an understanding of most theory, but some gaps present • Only partially uses theory to guide clinical practice	• Demonstrates an understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice, under guidance from supervisor	• Demonstrates a comprehensive understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice independently
4 - Direct Supervision Not Required Registrar can troubleshoot non-routine results independently, and critique procedures	• Demonstrates an understanding of most theory, but some weaknesses still present • Demonstrates the ability to use theory to guide clinical practice, but needs guidance from supervisor	• Demonstrates a strong understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice independently	• Demonstrates an extensive knowledge of theoretical concepts • Uses innovative thinking to suggest improvements to clinical practice

ENTRUSTMENT RATING SCALE BY ASSESSMENT CRITERIA

Application of relevant theory to clinical situations

Cognitive Domain

ENTRUSTMENT LEVEL	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
1 - Constant Direct Supervision Registrar can engage with the supervsior about why tests are performed	• Demonstrates a willingness to perform practical tasks without understanding why they are performed	• Demonstrates the ability to investigate/query the reasons for performing routine tasks	• Demonstrates an understanding of why routine tasks are performed
2 - Direct Supervision Registrar can explain why tests are performed	• Struggles to clearly demonstrate the link between theory and practice in routine tasks	• Demonstrates an understanding of why routine tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed
3 - Minimal Direct Supervision Registrar can troubleshoot non-routine results with support from supervisor	• Demonstrates only a basic understanding of why tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed • Demonstrates the ability to implement non-routine processes with close guidance from supervisor	• Demonstrates the ability to critique routine procedures • Demonstrates the ability to implement non-routine processes.
4 - Direct Supervision Not Required Registrar can troubleshoot non-routine results independently, and critique procedures	• Demonstrates an understanding of the rationale behind all work performed but cannot critique this work • Struggles to demonstrate the ability to implement non-routine processes	• Demonstrates the ability to critique routine procedures • Demonstrates the ability to independently implement non-routine processes	Demonstrated in practice the ability to lead developmental projects or critical reviews

Structured Learning Activities and Assesment Methods

ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine

ENTRUSTMENT RATING SCALE BY ASSESSMENT LEVELS

Entrustment level 1 - Constant Direct Supervision

Behavioural Domain

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Ability to perform practical tasks	• Demonstrates an understanding of how to perform only some of the practical tasks • Demonstrates only some ability to perform practical tasks even under constant supervision	• Demonstrates an understanding of how to perform the practical tasks • Demonstrates ability to perform practical tasks but still requires constant supervision • Demonstrates a lack of proficiency in practical tasks and must be constantly supervised	• Demonstrates an impressive understanding of how to perform basic practical tasks • Demonstrates ability to perform practical tasks with minimal input from supervisor • Demonstrates proficiency in practical tasks but still requires some indirect supervision
Clinical medical physics judgment and responsibility	• Demonstrates limited appreciation of the role of clinical judgment in routine work	• Demonstrates an appreciation of the role of clinical judgment in routine work	• Demonstrates sound clinical judgment in routine work • Demonstrates the ability to flag unusual results with supervisor

Cognitive Domain

Knowledge of clinical medical physics principles	• Demonstrates some gaps in knowledge of basic physics principles	• Demonstrates the ability to explain basic physics principles	• Demonstrates a good understanding of most relevant theory
Application of relevant theory to clinical situations	• Demonstrates a willingness to perform practical tasks without understanding why they are performed	• Demonstrates the ability to investigate/query the reasons for performing routine tasks	• Demonstrates an understanding of why routine tasks are performed

ENTRUSTMENT RATING SCALE BY ASSESSMENT LEVELS

Entrustment level 2 - Direct Supervision

Behavioural Domain

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Ability to perform practical tasks	• Demonstrates ability to perform practical tasks but still requires supervisor present at all times • Demonstrates a lack of proficiency in practical tasks and must be constantly supervised	• Demonstrates ability to perform practical tasks without constant supervision • Demonstrates proficiency in practical tasks with some prompting by supervisor	• Demonstrates ability to perform practical tasks concisely without constant supervision • Demonstrates independent proficiency in all practical tasks
Clinical medical physics judgment and responsibility	• Demonstrates limited appreciation of the meaning of the results • Cannot demonstrate the ability to flag unusual results with supervisor	• Demonstrates the ability to take part in a supervisor-led discussion on the clinical importance of the results • Demonstrates the ability to flag unusual results with supervisor	• Demonstrates the ability to independently discuss the clinical importance of the results • Demonstrates the ability to flag and hold a Registrar-led discussion about unusual results with supervisor

Cognitive Domain

Knowledge of clinical medical physics principles	• Demonstrates some gaps acquisition of relevant theory	• Demonstrates the acquisition of most relevant theory	• Demonstrates a strong understanding of all relevant theory
Application of relevant theory to clinical situations	• Struggles to clearly demonstrate the link between theory and practice in routine tasks	• Demonstrates an understanding of why routine tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed

Structured Learning Activities and Assesment Methods

ACPSEM
Australasian College of Physical Scientists & Engineers in Medicine

ENTRUSTMENT RATING SCALE BY ASSESSMENT LEVELS

Entrustment level 3 - Minimal Direct Supervision

Behavioural Domain

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Ability to perform practical tasks	• Demonstrates ability to perform most practical tasks, however consultation with supervisor is frequent or long • Demonstrates proficiency in most practical tasks with, however supervisor-initiated prompting is required	• Demonstrates ability to perform practical tasks with occasional consultation • Demonstrates proficiency in practical tasks with Registrar-initiated consultation with the supervisor	• Demonstrates ability to perform practical tasks concisely and to a high standard with minimal supervisor consultation • Demonstrates independent proficiency in practical tasks
Clinical medical physics judgment and responsibility	• Cannot demonstrate the ability discuss the clinical importance of results without heavy guidance from the supervisor • Demonstrates the ability to flag unusual results with supervisor, but discussions about these are supervisor-led • Demonstrates poor clinical judgment in routine work. Cannot demonstrate any responsibility for routine work	• Demonstrates the ability to independently discuss the clinical importance of the results • Demonstrates the ability to flag and hold a Registrar-led discussion about unusual results with supervisor • Has shared responsibility for routine work, but is not independent	• Demonstrates thorough and independent clinical judgment in both routine and non-routine work • Demonstrates some independent responsibility for routine work

Cognitive Domain

Knowledge of clinical medical physics principles	• Demonstrates an understanding of most theory, but some gaps present • Only partially uses theory to guide clinical practice	• Demonstrates an understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice, under guidance from supervisor	• Demonstrates a comprehensive understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice independently
Application of relevant theory to clinical situations	• Demonstrates only a basic understanding of why tasks are performed	• Demonstrates an understanding of the rationale and purpose behind all work performed • Demonstrates the ability to implement non-routine processes with close guidance from supervisor	• Demonstrates the ability to critique routine procedures • Demonstrates the ability to implement non-routine processes

ENTRUSTMENT RATING SCALE BY ASSESSMENT LEVELS

Entrustment level 4 - Direct Supervision Not Required

Behavioural Domain

CRITERION	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
Ability to perform practical tasks	• Demonstrates proficiency in practical tasks but still requires some indirect supervision • Demonstrates ability to independently perform practical tasks, however with some deficiencies such as taking excessive time, asking the supervisor about some routine tasks	• Demonstrates ability to independently perform practical tasks concisely and to a high standard • Demonstrates independent proficiency in practical tasks	• Demonstrates independent proficiency in practical tasks and may be trusted to supervise new registrars
Clinical medical physics judgment and responsibility	• Demonstrates sound clinical judgment but only in routine results • Has shared responsibility* for routine work, but is not independent	• Demonstrates thorough and independent clinical judgment in both routine and non-routine results • Demonstrates some responsibility* for routine work	• Demonstrates thorough and independent clinical judgment in, and innovative approaches to, routine and non-routine work • Demonstrated ability to adequately manage routine work

Cognitive Domain

Knowledge of clinical medical physics principles	• Demonstrates an understanding of most theory, but some weaknesses still present • Demonstrates the ability to use theory to guide clinical practice, but needs guidance from supervisor	• Demonstrates a strong understanding of all relevant theory • Demonstrates the ability to use theory to guide clinical practice independently	• Demonstrates an extensive knowledge of theoretical concepts • Uses innovative thinking to suggest improvements to clinical practice
Application of relevant theory to clinical situations	• Demonstrates an understanding of the rationale behind all work performed but cannot critique this work • Struggles to demonstrate the ability to implement non-routine processes	• Demonstrates the ability to critique routine procedures • Demonstrates the ability to independently implement non-routine processes	Demonstrated in practice the ability to lead developmental projects or critical reviews

Other Structured Learning Activities

Reflective Practice

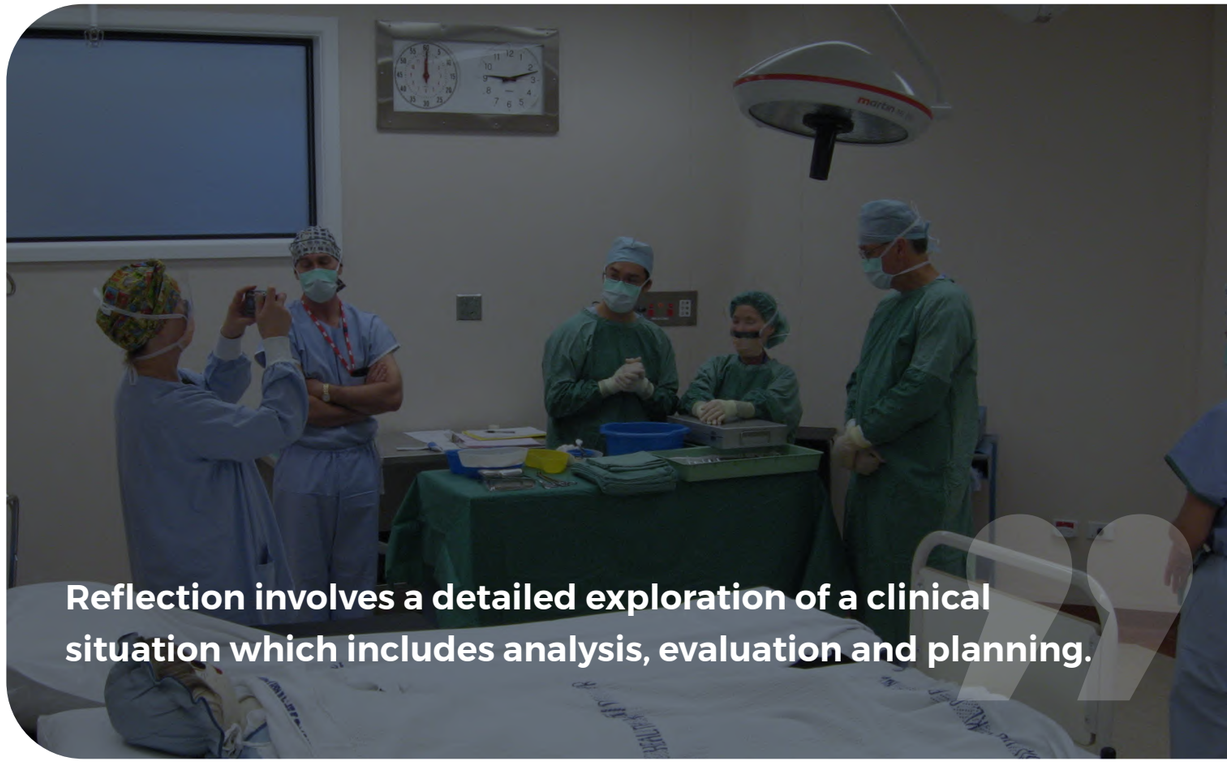
Reflective practice has been a component of medical training programs for many years. It proposes that professionals practice reflection-before-action, reflection-in-action, reflection-on-action and reflection-beyond-action to optimise the potential of learning. Reflection forms a way of knowing a professional typifies the subjective, explicatory, and contextual knowledge that emerges from practical experiences. Reflection involves a detailed exploration of a clinical situation which includes analysis, evaluation and planning. There are numerous models for reflection, but the broad process is similar in all models: what happened, why does this matter and what are the next steps? Reflection does not only have to be related to a personal experience but may be a reflection of others performance and may be based on either positive or negative situations.

In the ROMP TEAP there are key pieces of reflective work that must be undertaken in each Clinical and Scientific Report and it is also recommended for project-based clinical reports, however, Registrars should also be regularly writing their own personal reflection on various scenarios encountered in the clinic. This does not need to be a formal report, or in any particular style, nor is there any strict word-count. Reflective work is best reviewed on a regular basis between a Registrar and Supervisor to discuss the experiences in order to debrief the event and determine if there may be learning opportunities that can stem from it. Reflective practice evidence should be uploaded to the dedicated learning management system to form part of the evaluation of progress from stage to stage.

Multi-Source Feedback (MSF)

Multi-source feedback (MSF) (or 360-degree feedback) is an assessment of Registrar behaviour, interactions and skills by a number and variety of observers who have connections with the Registrar in the workplace. MSF is widely used in many medical professions as a tool to assist in assessment and feedback on an individual's performance in the areas of communication, collaboration, professionalism and management.

MSF is conducted using the learning management system and must be completed in at least Stage B and C and is encouraged in Stage A, noting that Registrars may have fewer interactions with other multidisciplinary team members in Stage A.



Reflection involves a detailed exploration of a clinical situation which includes analysis, evaluation and planning.

Clinical Induction to ROMP (Key Area 1)

Key Area 1 is to be undertaken within the first 6 months of commencing the ROMP TEAP. This online module is designed to introduce the new Registrar to the clinical foundations of radiation therapy as a treatment modality and the role that the ROMP plays within the Radiation Oncology setting. Working in a clinical environment will be a new experience for most Registrars and, as such, it is important that grounding in medical responsibility (including legal, ethical and safety) as well as empathy for the patient experience is appropriately highlighted.

There is an expectation that clinical departments will also provide Registrars with routine hospital induction processes and integrate them as a functional member of staff.

AD HOC LEARNING OPPORTUNITIES

Ad Hoc Learning Opportunities

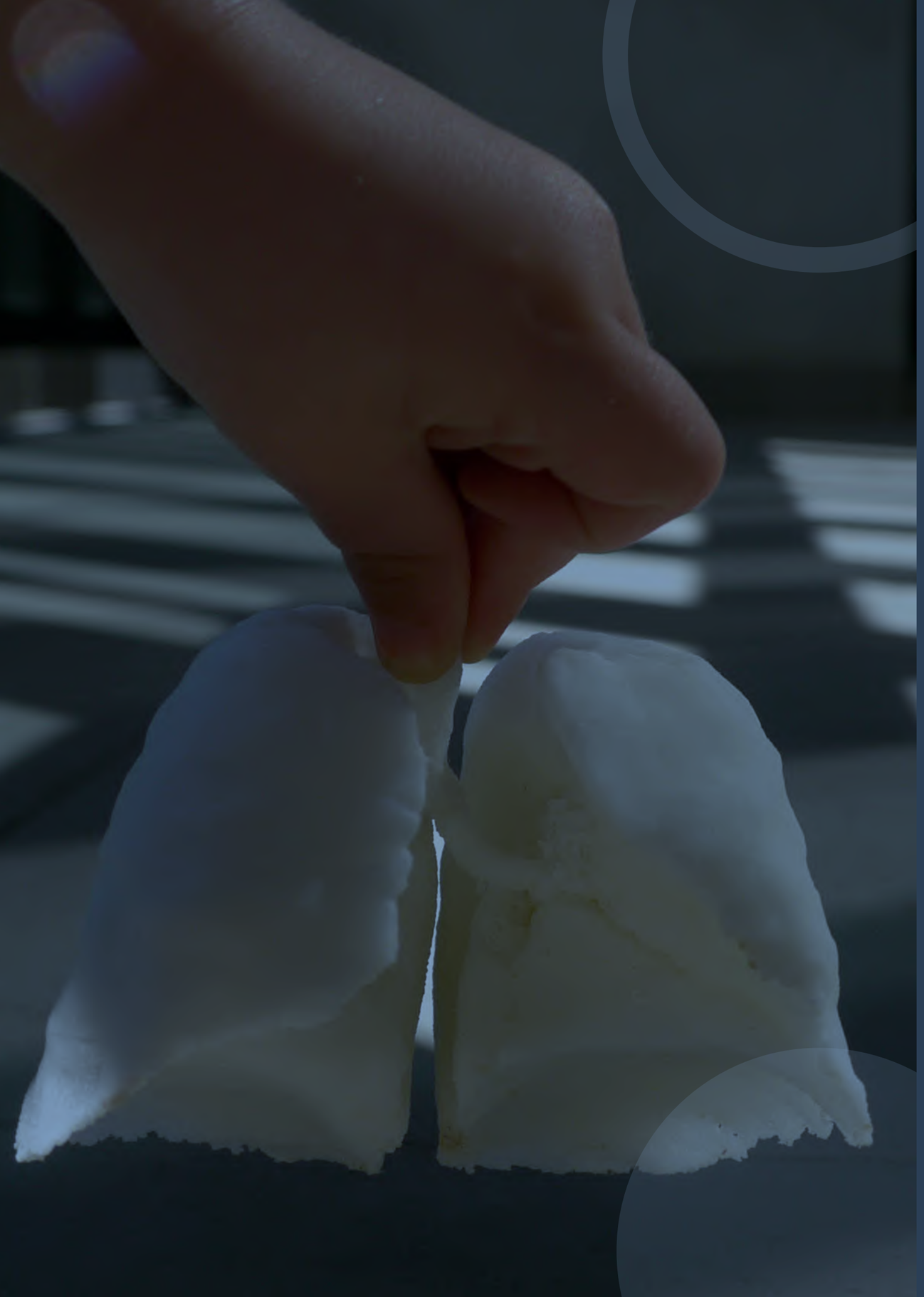
In addition to the mandatory SLAs, there will be a significant number of ad hoc learning opportunities that Registrars will be exposed to over the course of their clinical training. Whilst none of these are mandatory, each should be evaluated by Supervisors as to whether they may add value to the Registrar training experience and contribute as evidence of learning.

Examples of ad hoc learning opportunities include (but are not restricted to): Tutorials (both in-house, online and via workshops), Patient case studies, Departmental projects (e.g. commissioning) and non-routine QA, Informal discussions (Supervisors, Trainers, Registrars, other multidisciplinary staff or patients), Summaries of content or processes, Presentations (to ROMPs, Registrars, other multidisciplinary staff or patients)

Depending on the learning opportunity undertaken, the assessment rubrics from the SLAs may be relevant, or perhaps the conditions may provide an opportunity for reflective work.

Examples of ad hoc learning opportunities include (but are not limited or restricted to):

- Tutorials (both in-house, online and via workshops)
- Patient case studies
- Departmental projects (e.g. commissioning)
- Non-routine QA
- Informal discussions (Supervisors, Trainers, Registrars, other multidisciplinary staff or patients)
- Summaries of content or processes
- Presentations (to ROMPs, Registrars, other multidisciplinary staff or patients)



EVIDENCE REQUIREMENTS

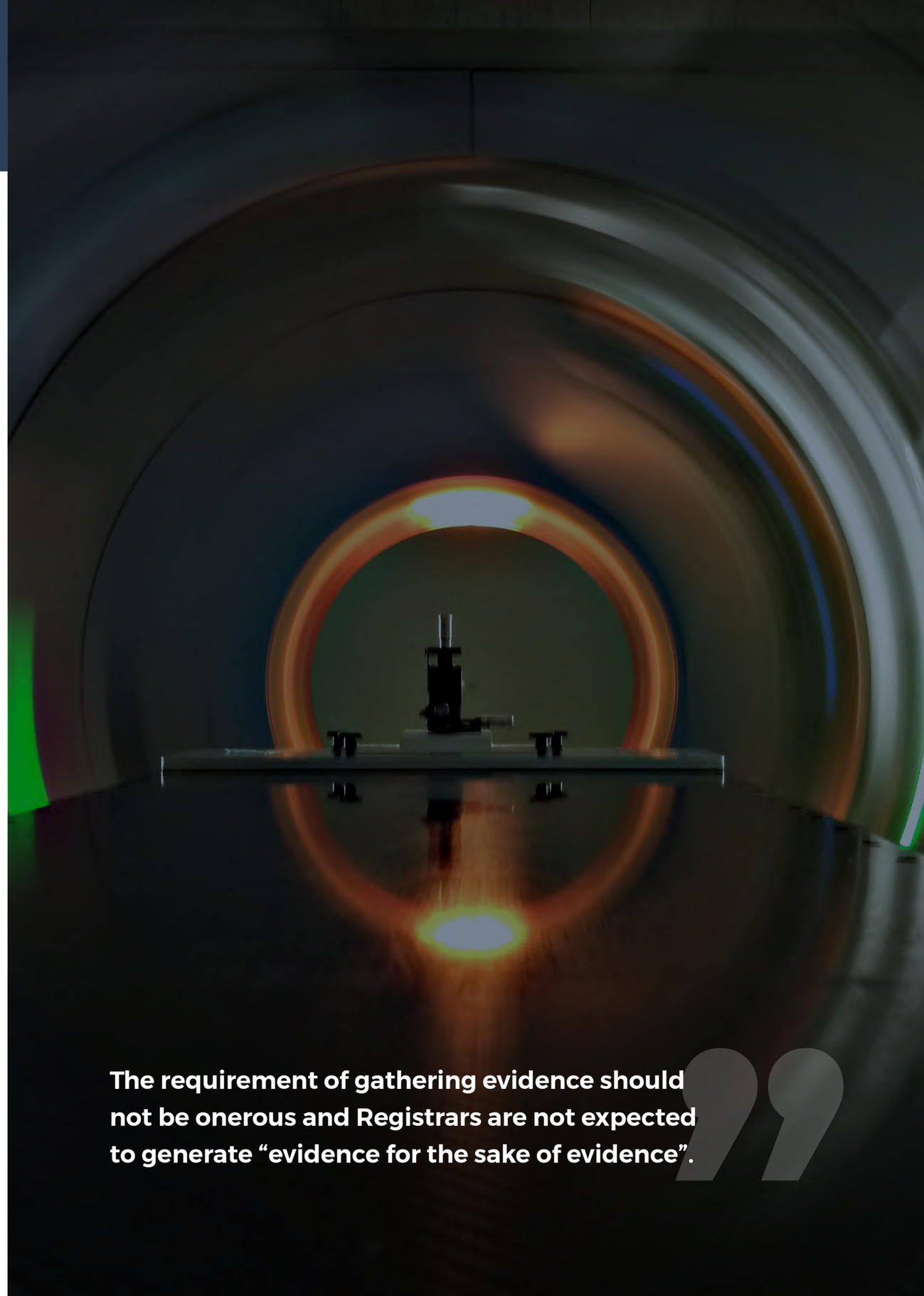
Evidence Requirements

In order for the relevant committee to make informed decisions on Registrar progress, evidence of learning and assessment must be uploaded into the learning management system. The requirement of gathering evidence should not be onerous and Registrars are not expected to generate “evidence for the sake of evidence”. Written reports (both Educational and Project-based), where indicated in the curriculum framework, should be designed for learning and not just an assessment tool, and ideally the piece of work should be completed as part of a requirement for the clinic. Registrars should be acquiring learning evidence as part of their day-to-day routine work and may upload attendance records, logbook entries and clinical QA data/reports to meet evidence requirements.

Evidence is not required to be in a formal format. Scans of paper documents or handwritten notes, or screenshots of spreadsheets are acceptable. Judicious use of rubrics will generate assessment evidence without the need for the Supervisor to provide substantial notes also.

General Assessment Activity

- Multiple Choice Question (MCQ) Activities
- Educational Reports
- Project-based Clinical Reports
- Entrustment Activities
- Reflective Practice
- Oral Examination
- Practical Examination
- Periodic Progress Reviews (PPRs)
- Oral Assessments
- Practical Activities
- Multi-Source Feedback (MSF)
- Written Examination
- Portfolio



The requirement of gathering evidence should not be onerous and Registrars are not expected to generate “evidence for the sake of evidence”.

HURDLE REQUIREMENTS

Hurdle Requirements

There are several “hurdles” that must be successfully completed at various points throughout the ROMP TEAP in order to progress to the next stage of training, or to gain final certification. These hurdles form a standardised method of Registrar assessment that is conducted by experts outside of the Registrar’s training department. Providing a wider assessment environment is in keeping with AMC and international registration body recommendations.

Post-graduate degree (MSc or PhD) in Medical Physics

Some Registrars may enter the ROMP TEAP having already completed a post-graduate degree in Medical Physics. Others may complete this work either at the time of enrolment in TEAP, or concurrently with clinical training, with the ROMP TEAP extended for these registrars to incorporate the additional time required. All options are allowable, and no particular pathway is preferable to the ACPSEM.

Registrars who have completed an MSc or PhD program that is not accredited by the ACPSEM may be exempted from the coursework or research components of an ACPSEM accredited MSc program if they can demonstrate equivalency. Assessment of external MSc or PhD programs will generally not be undertaken until the time of TEAP enrolment. At that point, any additional university coursework and/or research requirements will be made a requirement of TEAP completion and the program length will be extended to account for this.

Clinical and Scientific Reports (Stage A, B & C), including oral assessment of Clinical and Scientific Report (Stage C)

Registrars must submit three Clinical and Scientific Reports (CaSR) during their clinical training with each report externally assessed according to an assessment rubric. The reports will be marked online by a CaSR Assessor and structured feedback will be provided to Registrars and Supervisors.

The third report (in Stage C) will also be assessed via an oral interview conducted by video conference. The purpose of the interview is primarily to ensure that the Registrar completed the work presented in the report and that they understand its significance, but also to assess the verbal scientific communication skills of the Registrar. Registrars are expected to be able to explain the report data in detail and discuss limitations.

For further details, please refer to the ROMP TEAP Clinical and Scientific Report Guidelines.

Clinical and Scientific Reports Summary Information

Report	Due Date	Aim	Format	Assessment Method
Stage A	9 months after the Registrar commences clinical training	Demonstrate critical and thorough scientific thinking, high quality scientific writing and reflection upon work performed	Report on a routine medical physics task performed by the Registrar	Rubric based assessment of report
Stage B	Mid-way through the clinical training program	Demonstrate critical and thorough scientific thinking, high quality scientific writing, reflection upon work performed, independent decision making and competent scientific practice	Report on a small project done independently by the Registrar	Rubric based assessment of report
Stage C	Four months prior to final examinations	Demonstrate reflection upon the impact of work undertaken in context and ability to lead substantial clinical projects competently and safely	Report on significant clinical project managed by the Registrar	Rubric-based assessment of report AND oral assessment via video conference

Presentation at a recognised National or International Conference

Registrars are required to present a physics-based project that they have had responsibility for at an ACPSEM approved national or international conference. This may be the same project as a clinical and scientific report, or a different project. Conferences must require an accepted abstract submission that has undergone expert peer review as a condition to present and Registrars must be listed as the first author in the abstract. Both oral and poster presentations are acceptable, although an oral presentation is preferred as it allows the Registrar an opportunity to clearly express themselves in front of their professional colleagues. Presentations must be based on work completed during TEAP and presentations given prior to the commencement of TEAP will not fulfil the conference presentation requirement.

Hurdle Requirements

Written Examination

Registrars must sit and pass the written examination during Stage B of their clinical training. The written examination is a closed book, online examination that can be undertaken in sections (by Key Area), or as a singular exam.

The written exam questions will be based on content that the Registrar will have covered in several different Key Areas (KAs). This includes:

KA 2 (Radiation Safety and Protection): Learning Outcomes 2.1.1 to 2.2.2

KA 3 (Dosimetry): Learning Outcomes 3.1.1 to 3.2.2

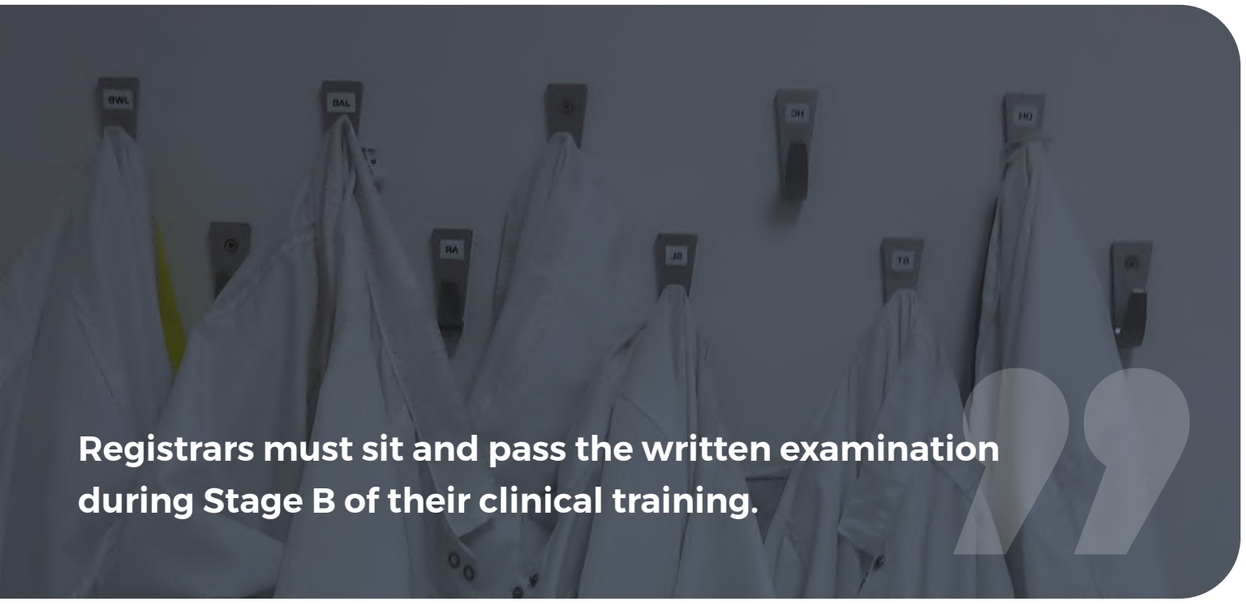
KA 4 (Linear Accelerator-Based Treatment): Learning Outcomes 4.1.1 to 4.2.4

KA 5 (MV External Beam Treatment Planning): Learning Outcomes 5.1.1 to 5.1.3, 5.2.1, 5.3.1 to 5.3.3 and 5.3.5

KA 6 (Superficial and Orthovoltage Therapy): Learning Outcomes 6.1.1 to 6.4.2

KA 7 (Imaging for Radiation Oncology): Learning Outcomes 7.1.1 to 7.1.3

KA 9 (Brachytherapy): Learning Outcomes 9.1.1. to 9.2.1



Registrars must sit and pass the written examination during Stage B of their clinical training.

In order to be eligible to sit the written examination for a KA, registrars must:

a) Be currently enrolled as a TEAP registrar at an ACPSEM accredited training centre

b) Have transitioned to Stage B as approved by the appropriate ACPSEM committee

c) Have completed all learning outcomes (listed above) for the specific KA, including achieving at least Level 2 in all entrustment activities (as certified by their Supervisor)

d) Have paid annual TEAP fees and any required examination fees. The ACPSEM may charge fees for the written examination, including fees for re-sits. Details of the current fee schedule may be obtained from the ACPSEM office

The passing grade for each individual exam is determined based on robust standard setting techniques. This passing grade represents the minimum standard of competence that allows a registrar to continue progressing through TEAP in that KA.

The following grades will apply to each KA in the written examination:

- Fail: the minimum standard has not been met
- Pass: the minimum standard has been met
- Pass+: the minimum standard has been exceeded by > 15%

If a registrar fails the written examination in a particular KA, they are permitted to re-attempt the written examination after a period of 2 months (subject to approval from the ROCP).

Hurdle Requirements

Oral Examination

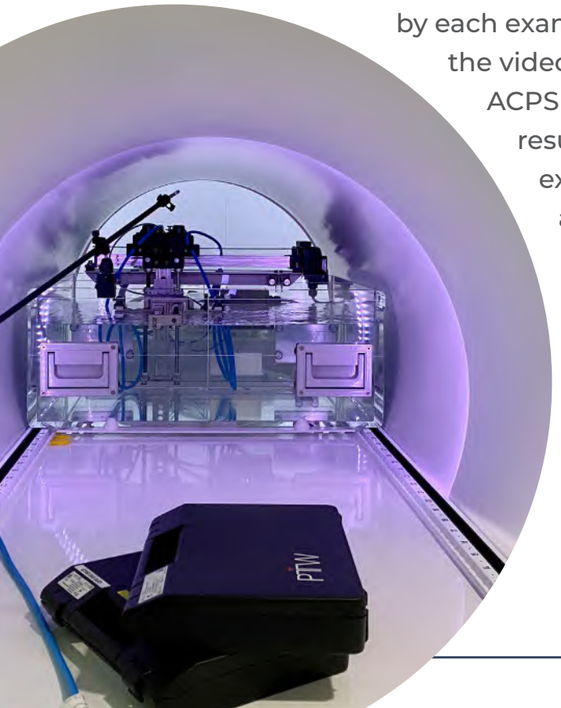
The oral and practical examination form the final hurdles for a Registrar to complete before gaining Certification. Registrar can apply to sit the final examinations once they have successfully completed all Learning Outcomes as well as the Presentation, Post-Graduate Degree, Written Examination and Clinical and Scientific Report components.

The Oral Examination is held via video conference within 2 weeks of the Practical Examination. **The examination runs for approximately 1.5 hours with time allocated for each question. There will be a series of 10 questions, with questions related to various key areas (KA):**

- Two questions from KA 2, KA 3, KA 4 and KA 5 with 8 questions total
- One question from KA 6 and/or KA 9 and/or KA 7 (CT only) with 2 questions total

Questions will be based on the level of knowledge that would be expected of a Registrar at the completion of TEAP and will be assessed based on the assessment criteria specified in Appendix 3. Questions for each KA will be asked from a pool of questions developed by the ROCP. Examiners may ask additional questions to follow up or expand on a Registrar's answers to the questions.

The questions asked and Registrar responses will be recorded by each examiner for independent grading purposes and the video conference will be recorded and held by the ACPSEM until the period for appeal of the examination result has passed. This video may be used by examiners to seek clarification on a Registrar's answers in the event the examiners cannot resolve grading differences. The Registrar may not bring any references or resources to the exam. A Pass+/Pass/Fail result will be provided and a Registrar who did not achieve a pass must re-sit this examination at a later date. A written report will be provided to Registrars who do not pass.



Practical Examination

The Practical Examination consists of one practical assignment (approximately 1.5 hours) followed by an oral discussion session (up to 0.5 hours) on the practical assignment. The examination will be held in the Registrar's normal clinical department with two external ROCP examiners attending on-site. The Registrar may, if they wish, nominate an observer to attend the examination.

The observer must be on the ACPSEM Register of Qualified Medical Physics Specialists for ROMPs.

Registrars may refer to textbooks, journal articles, departmental QA and commissioning records, departmental protocols and procedures and their own notes during the practical assignment. However, Registrars should note that excessive reliance on reference material during the examination will be taken into account by examiners when assessing the registrar against the assessment criteria specified in Appendix 4. In the oral component of the examination, examiners may use their discretion to determine what (if any) reference material the registrar may refer to.

Practical assignments for the examination may make use of any dosimetry, linear accelerator and CT equipment that is in clinical use in the Registrar's department. They will be based on the competencies in KA 2, KA 3, KA 4 and KA 7 (CT only).

KA 5 (MV External Beam Treatment Planning): Registrars may be asked to measure data required for treatment planning, such as data for monitor unit calculations, data to verify the accuracy of a planned treatment, or data to commission a treatment planning system. Registrars will not be required to use a treatment planning computer during the exam. Practical assignments will not require the use of kV or brachytherapy equipment.

A Pass+/Pass/Fail result will be provided and a Registrar who did not achieve a pass must re-sit this examination at a later date. A written report will be provided to Registrars who do not pass.

MONITORING, REVIEW AND FEEDBACK TOOLS

Monitoring, review and feedback tools

Periodic Progress Reviews (PPRs)

Periodic Progress Reviews (PPRs) are conducted by ROCP Assessors. PPRs include a group meeting with the Registrar, Supervisor and local coordinator/preceptor (if available). A pre-PPR form is to be completed by both the Registrar and Supervisor in order to determine if there are any areas of concern or specific questions to be addressed in this meeting and/or raised with an ACPSEM Coordinator. The purpose of the PPR is to:

- Confirm the Registrar is making satisfactory progress in accordance with the required milestones and hurdles, from a holistic perspective
- Provide a formal mechanism to investigate unsatisfactory progress and provide specific plans to support the Registrar
- Confirm the Registrar is complying with the ACPSEM's expectations for documenting their TEAP progress and is being appropriately assessed in their clinical department
- Provide an opportunity for external review, reflection and constructive feedback
- Provide a framework to facilitate standardisation of TEAP across Australia and New Zealand

Regular meetings between a Registrar and their Supervisor are an important component of the ROMP TEAP.

During the PPR, the Assessor will conduct a brief audit of learning outcome completion. The Assessor will have reviewed the Registrar's training and assessment evidence in the learning management system prior to the meeting. This evidence, together with the Registrar's answers to audit questions will allow the Assessor to confirm that the Registrar has been appropriately assessed for the specific learning outcome.

PPRs are considered a "low stakes" form of assessment, which means that the Registrar will not be graded a "pass" or "fail". The Assessor will complete a report and upload this to the learning management system. This report will contain constructive comments across the PPR assessment criteria (see Appendix 5).

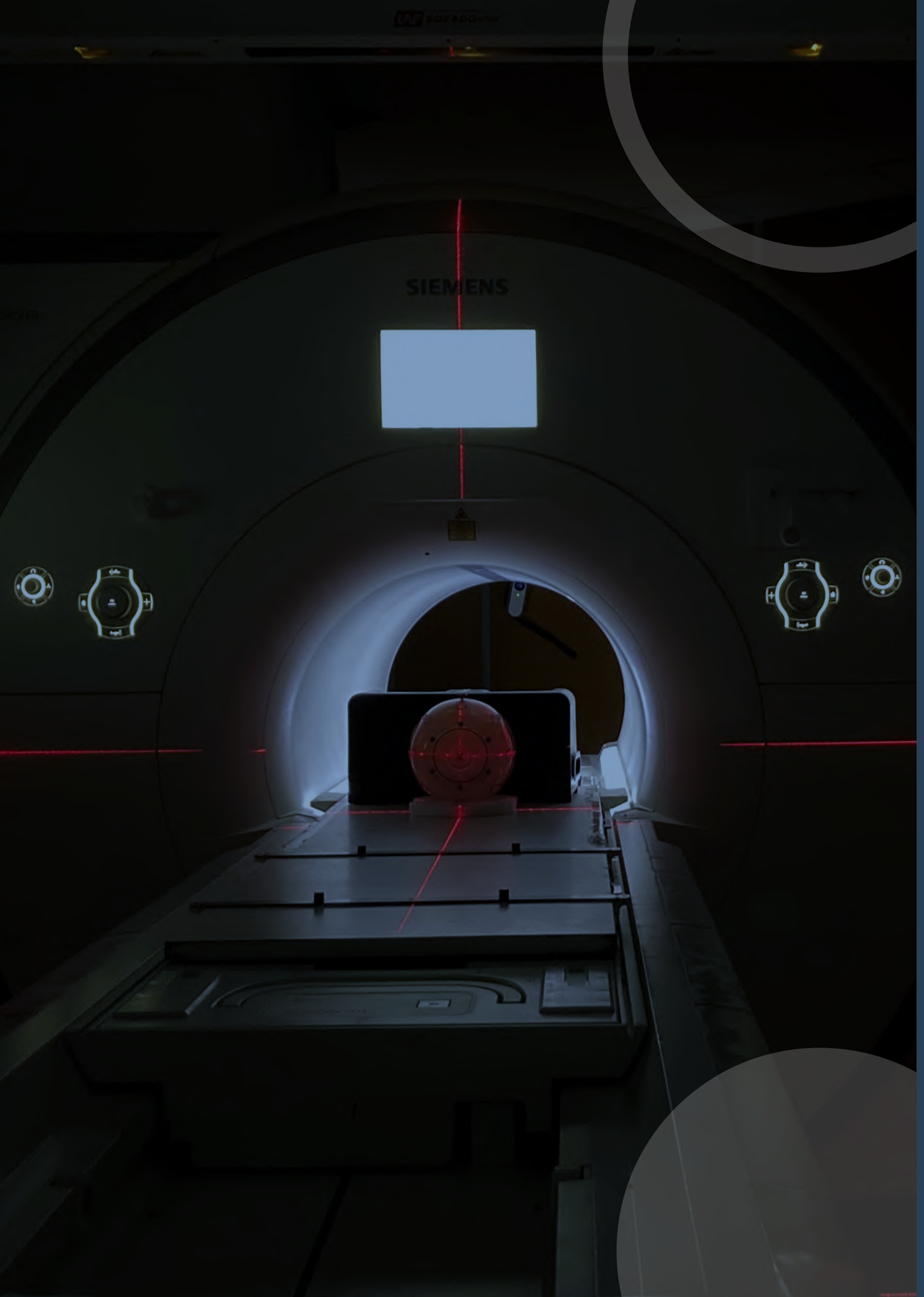
There may be specific action items for the Registrar or Supervisor to address before the next PPR. The timing of the next PPR can vary between 3 months and 12 months depending on the progress of the Registrar.

Routine Feedback Meetings (e.g. Fortnightly with Supervisor)

Regular meetings between a Registrar and their Supervisor are an important component of the ROMP TEAP. These meetings enable the Supervisor to keep up-to-date with the Registrar's training activities and plan for future tasks. The ACPSEM ROMP TEAP must be run to a tight timeline and planning of activities is critical in ensuring completion of learning outcomes is occurring at a sustainable and appropriate rate.

Routine meetings also provide an opportunity for the Registrar to ask questions, to clarify or to learn, and to receive feedback from the Supervisor. Positive or constructive feedback should be given early and often to prevent trivial issues from becoming larger ones, and to allow good performance to be recognised and reinforced.

Routine feedback meetings do not require formal minutes, although a record of items discussed may be helpful when approaching subsequent meetings.



PROGRESSION REQUIREMENTS AND PROCESS

Progression requirements and process

Registrar progress will be formally monitored at the expected conclusion of each Stage of TEAP by a Progression Committee. This committee will review material in the learning management system for evidence of satisfactory completion of the hurdle requirements and structured activities that must be completed at varying stages throughout the ROMP TEAP (see Figure 1). In most cases, review of this material will be sufficient to determine whether a Registrar is approved to transition from one Stage to the next. However, if there are concerns or questions raised during the review of evidence then a meeting between a Progression Committee representative, the Registrar and their Supervisor may be necessary.

STAGE A (FOUNDATION)

To transition from Stage A to Stage B, a Registrar must have successfully completed the Clinical Induction (KA 1) as well as Clinical and Scientific Report (Stage A) and the required structured learning activities to ensure progress as per Figure 2 for Stage A. Evidence of reflective practice should also be uploaded to the learning management system. The first Periodic Progress Review report (and any subsequent reports) will be assessed to determine whether any recommended tasks have also been completed.

STAGE B (CORE)

To transition from Stage B to Stage C, a Registrar must have successfully completed the Written Examination (all sections) and the Clinical and Scientific Report (Stage B). The required structured learning activities to ensure progress as per Figure 2 for Stage B must have been finalised. Evidence of reflective practice and Multi-Source Feedback should also be uploaded to the learning management system. Any Periodic Progress Review reports (for Stage B) will be assessed to determine whether any recommended tasks have also been completed.

STAGE C (CERTIFICATION)

To transition from Stage C to Certification, a Registrar must have successfully completed all of the structured learning activities for all of the curriculum learning outcomes. The Clinical and Scientific Report (Stage C), including the oral defence, as well as the post-graduate coursework/research degree and conference presentation should be complete. Evidence of reflective practice and Multi-Source Feedback should be uploaded to the learning management system. All of these activities must be finalized before approval is given to attempt the final Oral and Practical Examinations.

The final hurdle to meet for transition from Stage C to Certification is passing the Practical and Oral Examinations.

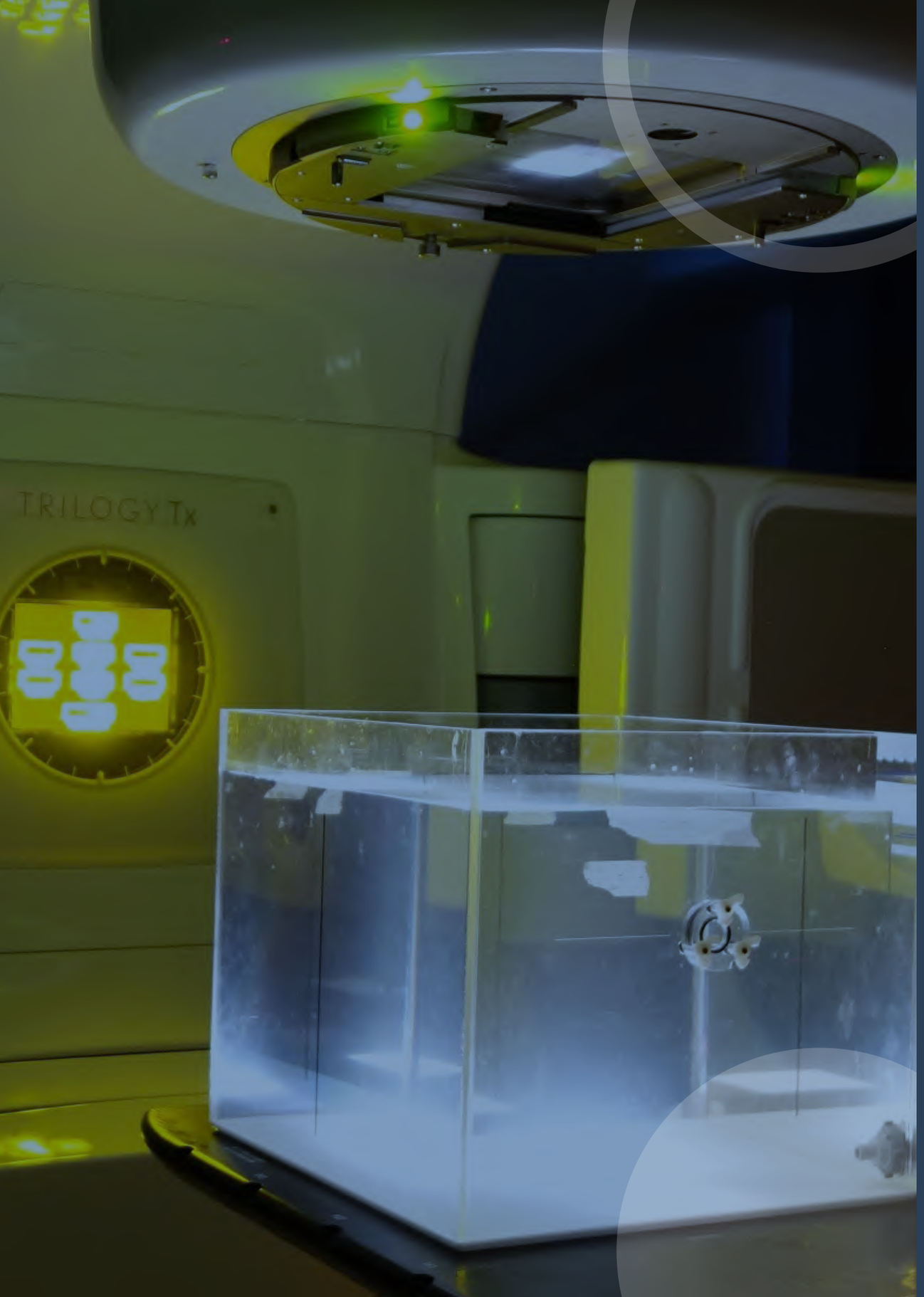
Remediation Pathways

The ACPSEM recognises the importance of arrangements that ensure that Registrars have access to support and remediation. Remediation in this context refers to a positive process formulated by TEAP coordinators, executed locally and in confidence, to help Registrars address performance-related issues that may impact their ability to successfully complete TEAP.

There are several pathways that may lead to the development of a remediation plan. These include:

1) Notification of Concern (NoC): A NoC may be submitted at any time to the ACPSEM by a TEAP Coordinator, Preceptor, Supervisor or other authorised ROMP to recommend consideration of remediation for a Registrar who, on balance, is at risk of not meeting ROMP TEAP requirements. It provides a means of reviewing Registrar progress when the next milestone for unsatisfactory progress or the specifics of the next milestone, will not enable timely, adequate or relevant action to be considered or taken.

2) Failure to progress from Stage A to B or Stage B to C as determined by the Progression Committee. In this instance, a remediation plan will be developed that clearly outlines the requirements for progression and the expected timeframe for completion.



APPENDICES

Appendices

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Appendix 1: Mapping between Learning Outcomes and Program Outcome Statements

Program Outcome Statements

1. Safety

Works safely within the clinical environment of radiation oncology through the application of evidence-based practice and risk management in compliance with regulations

2. Knowledge

Communicates scientific knowledge effectively and demonstrates skills for the core areas of radiation oncology

3. Critical thinking/problem solving

Provides sound radiation oncology medical physics guidance while exercising critical and innovative thinking, problem solving and judgement in a clinical or academic setting

4. Communication and teamwork

Communicates and collaborates effectively within a multidisciplinary team ensuring the patient and quality of care is of primary focus

5. Patient focused

Practices patient centred radiation oncology medical physics with compassion and respect, using ethical and professional values

6. Educator

Provides education, training and supervision to facilitate the functions of the profession

7. CPD

Demonstrates commitment to ongoing life-long professional development and learning

1 Safety
2 Knowledge
3 Critical thinking/ problem solving
4 Communication and teamwork
5 Patient focused
6 Educator
7 CPD

	Learning Outcome	Linked POS
KEY AREA 1: Clinical Induction to ROMP		
LO 1.1.1	Explain the foundations of Radiation Oncology	1 2 4 5
LO 1.1.2	Connect the foundations of Medical Physics to a Radiation Oncology setting	1 2 4 5
KEY AREA 2: Radiation Safety and Protection		
LO 2.1.1	Identify and discuss local radiation protection legislation	1 2 4 5
LO 2.1.2	Understand and practice radiation protection methods	1 2 3 4 6
LO 2.1.3	Explain radiation protection legal compliance	1 2 4 5
LO 2.1.4	Practice and advise on radiation protection	1 2 3 4 6

LO 2.2.1	Understand shielding techniques for linear accelerators	1 2 4
LO 2.2.2	Perform radiation surveys and compare to design calculations	1 2 3 4
LO 2.2.3	Practice and advise on shielding design for linear accelerators	1 2 3 4 6
LO 2.3.1	Describe common types of incidents and accidents and recognise prevention methods	1 2 4
LO 2.3.2	Describe and practice key actions and considerations for radiation incidents and accidents	1 2 3 4 6
LO 2.3.3	Manage safety and protection in relation to radiation incidents and accidents	1 2 3 4 5 6

KEY AREA 3: Dosimetry		
LO 3.1.1	Explain the theory of radiation detection and the operation of key detectors	1 2 4
LO 3.1.2	Describe and practice commissioning or QA for detectors	1 2 3 4
LO 3.1.3	Explain the theory of dosimetry phantoms and their use	1 2 4
LO 3.1.4	Describe and practice commissioning or QA for dosimetry systems	1 2 3 4

1 Safety 2 Knowledge 3 Critical thinking/ problem solving 4 Communication and teamwork

LO 3.1.5	Explain the purpose and theory of reference dosimetry	1 2 4
LO 3.1.6	Describe and practice absorbed dose measurement under reference conditions	1 2 3 4
LO 3.1.7	Explain the purpose and theory of non-reference (relative) dosimetry	1 2 4
LO 3.1.8	Explain the theory and measurement techniques of disequilibrium dosimetry	1 2 4
LO 3.1.9	Clinically apply measurements in conditions of disequilibrium	1 2 3 4
LO 3.2.1	Explain the purpose and theory of in vivo dosimetry	1 2 4
LO 3.2.2	Describe and practice in-vivo dosimetry for the department	1 2 3 4
LO 3.3.1	Manage a dosimetry project for the department	1 2 3 4 5 6

KEY AREA 4: Linear Accelerator-Based Treatment		
LO 4.1.1	Explain the operational principles of a linac and the physical principles of clinical beam production	1 2 4
LO 4.1.2	Explain how beam shaping works for clinical treatment	1 2 4

5 Patient focused 6 Educator 7 CPD

LO 4.1.3	Explain the attributes and control of clinical beams	1 2 4
LO 4.1.4	Perform and evaluate measurements used for linac acceptance, commissioning and routine QA	1 2 3 4 5 6
LO 4.1.5	Manage a linear accelerator for clinical use	1 2 3 4 5 6
LO 4.2.1	Explain the principles and aims of patient positioning	1 2 4
LO 4.2.2	Describe the mechanisms used to ensure accurate and reproducible patient positioning	1 2 4
LO 4.2.3	Perform quality assurance procedures for patient positioning, IGRT and motion management techniques and technologies	1 2 3 4 5
LO 4.2.4	Clinically apply patient positioning, IGRT and motion management strategies	1 2 3 4 5 6
LO 4.2.5	Manage patient positioning, IGRT and motion management systems	1 2 3 4 5 6

KEY AREA 5: MV External Beam Treatment Planning

LO 5.1.1	Describe radiobiological principles for patient treatment planning	1 2 4
LO 5.1.2	Describe external beam radiation therapy treatment planning systems	1 2 4 5
LO 5.1.3	Practice acceptance, commissioning, and QA for an external beam radiation therapy treatment planning system	1 2 3 4
LO 5.1.4	Evaluate aspects of radiation therapy treatment planning systems	1 2 3 4 5 6
LO 5.2.1	Understand imaging for external beam radiation therapy treatment planning	1 2 4
LO 5.3.1	Describe the requirements of a patient treatment plan	1 2 4
LO 5.3.2	Practice safe and optimal external beam radiation therapy treatment planning	1 2 3 4 5 6
LO 5.3.3	Practice treatment planning checks	1 2 3 4 5
LO 5.3.4	Explain new, specialist, or novel treatment techniques in the department	1 2 3 4 5 6
LO 5.3.5	Manage the quality of treatment plans	1 2 3 4 5 6

KEY AREA 6: Superficial and Orthovoltage Therapy

LO 6.1.1	Describe radiation protection measures for kV treatment units	1 2 4
LO 6.1.2	Understand and practice shielding techniques for kV treatment units	1 2 4

1 Safety · 2 Knowledge · 3 Critical thinking/ problem solving · 4 Communication and teamwork · 5 Patient focused · 6 Educator · 7 CPD

LO 6.2.1	Describe the design of kilovoltage therapy units and the physical principles of clinical beam production	1 2 4
LO 6.2.2	Describe the commissioning and QA tests of a kilovoltage therapy unit	1 2 3 4
LO 6.3.1	Describe key kV treatment unit dosimetry protocols	1 2 4
LO 6.4.1	Describe the principles of kV external beam radiotherapy treatment planning	1 2 4
LO 6.4.2	Describe kV external beam treatment planning according to established protocols	1 2 3 4 5

KEY AREA 7: Imaging for Radiation Oncology		
LO 7.1.1	Describe the physical principles and operation of CT scanners used for radiation therapy imaging	1 2 4
LO 7.1.2	Describe and practice acceptance, commissioning or QA for a CT scanner	1 2 3 4
LO 7.1.3	Understand and practice shielding techniques used for CT scanners	1 2 4
LO 7.2.1	Describe the physical principles, operation, and safety of MRI systems	1 2 4
LO 7.2.2	Describe how MRI images are used in the management of cancer	1 2 4
LO 7.3.1	Describe the basics of PET, SPECT and gamma camera systems	1 2 4
LO 7.3.2	Describe how PET/SPECT/gamma camera images are used in the management of cancer	1 2 4

KEY AREA 8: Information and Communication Technology		
LO 8.1.1	Describe the key design principles and operation of Oncology Information Systems	1 2 4
LO 8.2.1	Describe the patient data types related to radiation therapy treatment	1 2 4
LO 8.2.2	Explain the principle of relational database implementations within the radiation therapy process	1 2 4
LO 8.3.1	Explain the theory and purpose of medical image analysis	1 2 4
LO 8.4.1	Explain software automation and AI applications in clinical practice	1 2 4
LO 8.4.2	Describe big data and enterprise imaging	1 2 4
LO 8.4.3	Compare and contrast the quality, regulatory, and ethical Issues of data utilisation, with the advantages of automation, software development and AI processes	1 2 3 4 5

1 Safety
2 Knowledge
3 Critical thinking/ problem solving
4 Communication and teamwork
5 Patient focused
6 Educator
7 CPD

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KEY AREA 9: Brachytherapy		
LO 9.1.1	Explain radiation safety and protection as it relates to radioactive sources	1 2 4
LO 9.1.2	Explain HDR brachytherapy as a treatment modality	1 2 3 4 5
LO 9.1.3	Describe clinical HDR delivery systems	1 2 4
LO 9.1.4	Describe source strength determination methods	1 2 4
LO 9.1.5	Describe the clinical use of HDR treatment planning systems	1 2 3 4 5
LO 9.1.6	Explain the use of imaging systems for applicator insertion and treatment planning	1 2 4
LO 9.2.1	Explain the fundamental principles of LDR brachytherapy	1 2 4

KEY AREA 10: Advanced Technologies		
LO 10.1.1	Describe the principles of proton therapy	1 2
LO 10.1.2	Explain proton/heavy ion physics and proton/heavy ion dosimetry	1 2
LO 10.1.3	Describe proton beam delivery systems	1 2
LO 10.1.4	Describe basic proton beam treatment planning	1 2
LO 10.2.1	Connect fundamental physical principles to the operation of MRI linacs	1 2
LO 10.2.2	Connect MRI linac physics and the fundamentals of dosimetry	1 2
LO 10.2.3	Explain MRI linac treatment planning	1 2

1 Safety
2 Knowledge
3 Critical thinking/ problem solving
4 Communication and teamwork
5 Patient focused
6 Educator
7 CPD

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Appendix 2: Mapping between Learning Outcomes and Assessment Evidence

A standard setting approach was used to collate expert judgment from the ROMP Assessment Working Group and map each Learning Outcome to an expected form of Assessment Evidence. The six categories are:

Multiple Choice Question (MCQ) Activity, which may be an online set of questions or routine quiz.

Written Task or Report, which may be a specific set of written questions or tasks to complete in a certain timeframe.

Oral Assessment, which may be with a supervisor or assessor, and take the form of a series of structured oral questions with specific prompts and follow-up probing questions.

Practical Activity, which may be a specific practical task, potentially observed and timed, or set by a supervisor or assessor and then results reviewed.

Entrustment Activity, which may be routine (day-to-day) work that maps to a LO, and the supervisor (or other assessor) uses the Entrustment Scale to rate the Registrar's level of entrustment. Repeat ratings should be recorded to show improvement over time.

Online Assessment, are assessment activities completed entirely within the learning management system and may consist of MCQs, reflective practice or short answer questions.

Note: MCQ resources are currently an active area of resource development. If there are no MCQ resources available for a particular learning outcome, this learning outcome should be assessed via oral assessment.

	Learning Outcome	Assessment Evidence
KEY AREA 1: Clinical Induction to ROMP		
LO 1.1.1	Explain the foundations of Radiation Oncology	Online Assessment
LO 1.1.2	Connect the foundations of Medical Physics to a Radiation Oncology setting	Online Assessment
KEY AREA 2: Radiation Safety and Protection		
LO 2.1.1	Identify and discuss local radiation protection legislation	Oral Assessment
LO 2.1.2	Understand and practice radiation protection methods	Oral Assessment
LO 2.1.3	Explain radiation protection legal compliance	Oral Assessment
LO 2.1.4	Practice and advise on radiation protection	Written Task or Report
LO 2.2.1	Understand shielding techniques for linear accelerators	Written Task or Report
LO 2.2.2	Perform radiation surveys and compare to design calculations	Practical Activity
LO 2.2.3	Practice and advise on shielding design for linear accelerators	Written Task or Report
LO 2.3.1	Describe common types of incidents and accidents and recognise prevention methods	MCQ Activity
LO 2.3.2	Describe and practice key actions and considerations for radiation incidents and accidents	Practical Activity
LO 2.3.3	Manage safety and protection in relation to radiation incidents and accidents	Practical Activity

	Learning Outcome	Assessment Evidence
KEY AREA 3: Dosimetry		
LO 3.1.1	Explain the theory of radiation detection and the operation of key detectors	MCQ Activity
LO 3.1.2	Describe and practice commissioning or QA for detectors	Practical Activity
LO 3.1.3	Explain the theory of dosimetry phantoms and their use	MCQ Activity
LO 3.1.4	Describe and practice commissioning or QA for dosimetry systems	Practical Activity
LO 3.1.5	Explain the purpose and theory of reference dosimetry	Oral Assessment
LO 3.1.6	Describe and practice absorbed dose measurement under reference conditions	Entrustment Activity
LO 3.1.7	Explain the purpose and theory of non-reference (relative) dosimetry	MCQ Activity
LO 3.1.8	Explain the theory and measurement techniques of disequilibrium dosimetry	Oral Assessment
LO 3.1.9	Clinically apply measurements in conditions of disequilibrium	Entrustment Activity
LO 3.2.1	Explain the purpose and theory of in vivo dosimetry	Oral Assessment
LO 3.2.2	Describe and practice in-vivo dosimetry for the department	Entrustment Activity
LO 3.3.1	Manage a dosimetry project for the department	Written Task or Report

	Learning Outcome	Assessment Evidence
KEY AREA 4: Linear Accelerator-Based Treatment		
LO 4.1.1	Explain the operational principles of a linac and the physical principles of clinical beam production	MCQ Activity
LO 4.1.2	Explain how beam shaping works for clinical treatment	MCQ Activity
LO 4.1.3	Explain the attributes and control of clinical beams	Oral Assessment
LO 4.1.4	Perform and evaluate measurements used for linac acceptance, commissioning and routine QA	Entrustment Activity
LO 4.1.5	Manage a linear accelerator for clinical use	Entrustment Activity
LO 4.2.1	Explain the principles and aims of patient positioning	Oral Assessment
LO 4.2.2	Describe the mechanisms used to ensure accurate and reproducible patient positioning	Oral Assessment
LO 4.2.3	Perform quality assurance procedures for patient positioning, IGRT and motion management techniques and technologies	Entrustment Activity
LO 4.2.4	Clinically apply patient positioning, IGRT and motion management strategies	Written Task or Report
LO 4.2.5	Manage patient positioning, IGRT and motion management systems	Written Task or Report

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	Learning Outcome	Assessment Evidence
KEY AREA 5: MV External Beam Treatment Planning		
LO 5.1.1	Describe radiobiological principles for patient treatment planning	Oral Assessment
LO 5.1.2	Describe external beam radiation therapytreatment planning systems	Written Task or Report
LO 5.1.3	Practice acceptance, commissioning, and QA for an external beam radiation therapy treatment planning system	Entrustment Activity
LO 5.1.4	Evaluate aspects of radiation therapy treatment planning systems	Oral Assessment
LO 5.2.1	Understand imaging for external beam radiation therapy treatment planning	Entrustment Activity
LO 5.3.1	Describe the requirements of a patient treatment plan	MCQ Activity
LO 5.3.2	Practice safe and optimal external beam radiation therapy treatment planning	Entrustment Activity
LO 5.3.3	Practice treatment planning checks	Entrustment Activity
LO 5.3.4	Explain new, specialist, or novel treatment techniques in the department	Oral Assessment
LO 5.3.5	Manage the quality of treatment plans	Entrustment Activity

	Learning Outcome	Assessment Evidence
KEY AREA 6: Superficial and Orthovoltage Therapy		
LO 6.1.1	Describe radiation protection measures for kV treatment units	Oral Assessment
LO 6.1.2	Understand and practice shielding techniques for kV treatment units	Written Task or Report
LO 6.2.1	Describe the design of kilovoltage therapy units and the physical principles of clinical beam production	MCQ Activity
LO 6.2.2	Describe the commissioning and QA tests of a kilovoltage therapy unit	Written Task or Report
LO 6.3.1	Describe key kV treatment unit dosimetry protocols	Written Task or Report
LO 6.4.1	Describe the principles of kV external beam radiation therapy treatment planning	MCQ Activity
LO 6.4.2	Describe kV external beam treatment planning according to established protocols	Oral Assessment

Appendices

	Learning Outcome	Assessment Evidence
KEY AREA 7: Imaging for Radiation Oncology		
LO 7.1.1	Describe the physical principles and operation of CT scanners used for radiation therapy imaging	**Oral Assessment**
LO 7.1.2	Describe and practice acceptance, commissioning or QA for a CT scanner	**Entrustment Activity**
LO 7.1.3	Understand and practice shielding techniques used for CT scanners	**Written Task or Report**
LO 7.2.1	Describe the physical principles, operation, and safety of MRI systems	**Oral Assessment**
LO 7.2.2	Describe how MRI images are used in the management of cancer	**Oral Assessment**
LO 7.3.1	Describe the basics of PET, SPECT and gamma camera systems	**Oral Assessment**
LO 7.3.2	Describe how PET/SPECT/gamma camera images are used in the management of cancer	**Oral Assessment**

	Learning Outcome	Assessment Evidence
KEY AREA 8: Information and Communication Technology		
LO 8.1.1	Describe the key design principles and operation of Oncology Information Systems	**Written Task or Report**
LO 8.2.1	Describe the patient data types related to radiation therapy treatment	**Written Task or Report**
LO 8.2.2	Explain the principle of relational database implementations within the radiation therapy process	**Written Task or Report**
LO 8.3.1	Explain the theory and purpose of medical image analysis	**Written Task or Report**
LO 8.4.1	Explain software automation and AI applications in clinical practice	**Written Task or Report**
LO 8.4.2	Describe big data and enterprise imaging	**Written Task or Report**
LO 8.4.3	Compare and contrast the quality, regulatory, and ethical Issues of data utilisation, with the advantages of automation, software development and AI processes	**Written Task or Report**

	Learning Outcome	Assessment Evidence
KEY AREA 9: Brachytherapy		
LO 9.1.1	Explain radiation safety and protection as it relates to radioactive sources	Oral Assessment
LO 9.1.2	Explain HDR brachytherapy as a treatment modality	Written Task or Report
LO 9.1.3	Describe clinical HDR delivery systems	Written Task or Report
LO 9.1.4	Describe source strength determination methods	Written Task or Report
LO 9.1.5	Describe the clinical use of HDR treatment planning systems	Written Task or Report
LO 9.1.6	Explain the use of imaging systems for applicator insertion and treatment planning	Oral Assessment
LO 9.2.1	Explain the fundamental principles of LDR brachytherapy	Written Task or Report

	Learning Outcome	Assessment Evidence
KEY AREA 10: Advanced Technologies		
LO 10.1.1	Describe the principles of proton therapy	Online Assessment
LO 10.1.2	Explain proton/heavy ion physics and proton/heavy ion dosimetry	Online Assessment
LO 10.1.3	Describe proton beam delivery systems	Online Assessment
LO 10.1.4	Describe basic proton beam treatment planning	Online Assessment
LO 10.2.1	Connect fundamental physical principles to the operation of MRI linacs	Online Assessment
LO 10.2.2	Connect MRI linac physics and the fundamentals of dosimetry	Online Assessment
LO 10.2.3	Explain MRI linac treatment planning	Online Assessment

APPENDIX 3: Assessment Criteria for the Oral Examination

Each question in the oral examination is independently graded by the examiners, and the resulting grade for each question reached on consensus (if grades are differing). The grade for each question in the oral examination is awarded as follows:

Holistic Grade	Description
Pass + (P+)	**Represents high quality performance on the category in question** • Provides all essential criteria and the majority of desirable criteria expected by examiners for the question as detailed in the attached rubric • Performs at an advanced level, well-exceeds minimum standard
Pass (P)	**Represents satisfactory performance on the category in question** • Provides all essential criteria with limited prompting expected by examiners for the question as detailed in the attached rubric • Performs at level of competence, meets minimum standard
Borderline (B)	**Represents borderline performance on the category in question** • Provides more than half of essential criteria expected by examiners for the question as detailed in the attached rubric but misses some important detail even with prompting • Competence level is not clearly demonstrated • Not a clear pass, not a clear fail
Fail (F)	**Represents poor performance on the category in question** • Provides few or no essential criteria expected by examiners for the question as detailed in the attached rubric, and misses most detail • Performs at level of incompetence, well below minimum standard • **If candidate responds with an unsafe or potentially dangerous response the candidate will automatically fail**

The table below indicates the final grade to be awarded for KA 2, KA 3, KA 4 and KA 5. This table is also used to generate a final grade for the 2 questions asked from KA 6 and/or KA 9 and/or KA 7 (CT only) – maximum of 1 question per KA.

QUESTION	QUESTION	KEY AREA GRADE
Pass + (P+)	Pass + (P+)	Pass + (P+)
Pass + (P+)	Pass (P)	Pass + (P+)
Pass + (P+)	Borderline (B)	Pass (P)
Pass + (P+)	Fail (F)	Borderline (B)
Pass (P)	Pass (P)	Pass (P)
Pass (P)	Borderline (B)	Pass (P)
Pass (P)	Fail (F)	Borderline (B)
Borderline (B)	Borderline (B)	Borderline (B)
Borderline (B)	Fail (F)	Fail (F)
Fail (F)	Fail (F)	Fail (F)

KEY AREA GRADES (6 KAs)	FINAL GRADE
At least 2 Pass + (P+) with the rest Pass (P)	Pass + (P+)
2 or more Borderline (B)	Fail (F)
1 or more Fail (F)	Fail (F)
Any other combination	Pass (P)

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APPENDIX 4: Assessment criteria for the Practical Examination

The assigned task in the practical examination will be marked independently by the examiners, and the resulting grade for each expectation reached on consensus (if grades are differing). The expectations assessed in the practical exam are provided in the table below. Additional essential and desirable criteria are question/task specific and are not listed here.

Eight Expectations for Practical Examination Performance	GRADE
Briefing stage (general scenario)	
Expectation 1: Demonstrates a thorough understanding of the specific scenario given. Should include concise identification of: • theoretical aspects relating to scenario • appropriate tests • the relevant guidelines • results to be expected from the task	
Practical stage	
Expectation 2: Selects/describes appropriate methods, tests and measurements (including the sequence) with the appropriate equipment	
Expectation 3. Performs tests and measurements correctly, carefully, proficiently and logically. For example: • Perform tasks with precision and accuracy • Undertakes tasks in a logical order • Takes care with processes and equipment • Works efficiently	
Analysis and interpretation stage	
Expectation 4: Processes the results of the tests and measurements correctly. Should include: • Accurate calculation of results • Comparison to relevant baseline/reference values	
Expectation 5: Interprets and appreciates the significance of results obtained. Includes: • Ability to synthesize and evaluate results • Explain the causes of divergence from expectations • Quote relevant references • Appreciates clinical significance and departmental impacts	
Discussion and review stage	
Expectation 6: Communicates scientific information clearly and accurately. Requires: • Explanation of steps throughout task (where required) • The ability to verbalise results • Presents information concisely	
Expectation 7: Awareness of limitations. May include: • Acknowledging errors made during the task • Knowing where to look for further information • Areas where referral/checks required	
Overall safety	
Expectation 8: Demonstrated safe work practices. For example: • Safe use of equipment • Demonstrates awareness of radiation safety • Ensures safety of patients, staff and the public	

The grades awarded for each expectation are defined as follows:

Holistic Grade	DESCRIPTION
Pass + (P+)	**Represents high quality performance on the category in question** • Provides all detail expected by examiners for the component in question as detailed in the grading rubric • Performs at an advanced level, exceeds minimum standard
Pass (P)	**Represents satisfactory performance on the category in question** • Provides a majority of detail expected by examiners for the category in question as detailed in the grading rubric • Performs at level of competence, meets minimum standard
Borderline (B)	**Represents borderline performance on the category in question** • Provides some detail expected by examiners for the category in question as detailed in the grading rubric, but misses some important detail • Competence level is not clearly demonstrated • Not a clear pass, not a clear fail
Fail (F)	**Represents poor performance on the category in question** • Provides few aspects expected by examiners for the category in question as detailed in the grading rubric, and misses most detail • Performs at level of incompetence, well below minimum standard

To pass the examination overall, Registrars:

- Must achieve a consensus score of P or P+ in Expectation 8
- Must have a consensus P or P+ for at least 5 of the remaining 7 expectations
- Cannot have more than one (consensus) F.

APPENDIX 5: Periodic Progress Review (PPR) Assessment Rubric

	FALLS WELL SHORT OF EXPECTATIONS	FALLS SHORT OF EXPECTATIONS	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
(i) Knowledge of clinical medical physics principles	Early in training • Demonstrates significant gaps in breadth or depth of knowledge of basic physics principles. Mid-point in training • Demonstrates significant gaps in acquisition of relevant theory. Late in training • Demonstrates significant gaps in knowledge base of important theory.	Early in training • Demonstrates some gaps in breadth or depth of knowledge of basic physics principles. Mid-point in training • Demonstrates some gaps in breadth or depth of acquisition of relevant theory. Late in training • Demonstrates an understanding of most theory, but some gaps present. • Only partially uses theory to guide clinical practice	Early in training • Demonstrates the ability to explain basic physics principles. Mid-point in training • Demonstrates the acquisition of most relevant theory. Late in training • Demonstrates a strong understanding of all relevant theory. • Is able to use theory to guide clinical practice	Early in training • Demonstrates a good understanding of most relevant theory. Mid-point in training • Demonstrates a strong understanding of all relevant theory. Late in training • Demonstrates a comprehensive and cutting-edge knowledge of theoretical concepts. • Uses cutting-edge theory to improve clinical practice
(ii) Ability to perform practical tasks	Early in training • Demonstrates significant gaps in understanding of how to perform basic practical tasks. Mid-point in training • Demonstrates only some ability to perform practical tasks even under direct supervision. Late in training • Demonstrates a lack of proficiency in practical tasks and must be directly supervised.	Early in training • Demonstrates and understanding of how to perform only some basic practical tasks. Mid-point in training • Demonstrates ability to perform practical tasks but still requires direct supervision. Late in training • Demonstrates proficiency in practical tasks but still requires some indirect supervision.	Early in training • Demonstrates an understanding of how to perform basic practical tasks. Mid-point in training • Demonstrates ability to perform practical tasks without direct supervision. Late in training • Demonstrates independent proficiency in practical tasks.	Early in training • Demonstrates an impressive understanding of how to perform basic practical tasks. Mid-point in training • Demonstrates ability to perform practical tasks to a high standard without direct supervision. Late in training • Demonstrates independent proficiency in practical tasks and may supervise new Registrars.
(ii) Application of relevant theory to clinical situations	Early in training • Fails to demonstrate the link between theory and practice in routine tasks. Mid-point in training • Does not demonstrate an understanding of why some work is performed. Late in training • Struggles to demonstrate an understanding of the purpose of some work performed. • Cannot demonstrate the ability to implement non-routine processes	Early in training • Struggles to clearly demonstrate the link between theory and practice in routine tasks. Mid-point in training • Demonstrates only a basic understanding of why tasks are performed. Late in training • Demonstrates an understanding of the rationale behind all work performed but cannot critique this work. • Struggles to demonstrate the ability to implement non-routine processes	Early in training • Demonstrates an understanding of why routine tasks are performed. Mid-point in training • Demonstrates an understanding of the rationale and purpose behind all work performed. Late in training • Demonstrates the ability to critique routine procedures. • Demonstrates the ability to implement non-routine processes	Early in training • Demonstrates an understanding of the rationale and purpose behind all work performed. Mid-point in training • Demonstrates the ability to critique routine procedures. • Demonstrates the ability to implement non-routine processes. Late in training • Demonstrated in practice the ability to lead developmental projects or critical reviews.
(iv) Clinical medical physics judgment and responsibility	Early in training • Demonstrates little to no appreciation of the role of clinical judgment in routine work. Mid-point in training • Demonstrates poor clinical judgment in routine work. Late in training • Demonstrates poor clinical judgment in some routine and in non-routine work. • Cannot demonstrate any responsibility for routine work'	Early in training • Demonstrates limited appreciation of the role of clinical judgment in routine work. Mid-point in training • Demonstrates sound clinical judgment in only some routine work. Late in training • Demonstrates sound clinical judgment but only in routine work. • Has shared responsibility for routine work, but is not independent	Early in training • Demonstrates an appreciation of the role of clinical judgment in routine work. Mid-point in training • Demonstrates sound clinical judgment in routine work. Late in training • Demonstrates thorough and independent clinical judgment in both routine and non-routine work. • Demonstrates some responsibility for routine work	Early in training • Demonstrates sound clinical judgment in routine work. Mid-point in training • Demonstrates sound clinical judgment in routine work and some non-routine work. Late in training • Demonstrates thorough and independent clinical judgment in, and innovative approaches to, routine and non-routine work. • Demonstrated ability to adequately manage routine work
(v) Communication	Early in training • Fails to communicate effectively with others in all environments. Major deficiencies in scientific writing. Major deficiencies in oral scientific communication. Poor understanding of professional conduct. Mid-point in training • Fails to communicate effectively with others in all environments. Major deficiencies in scientific writing. Major deficiencies in oral scientific communication. Poor understanding of professional conduct. Late in training • Limited scientific communication and interpersonal communication, or major deficiencies in communication.	Early in training • Demonstrates limited scientific communication skills and limited understanding of code-of-conducts in a professional setting. Mid-point in training • Demonstrates reasonable scientific communication but struggles with professional communication skills. OR • Demonstrates reasonable professional communication but struggles with scientific communication skills. Late in training • Demonstrates sound scientific but limited interpersonal communication in a wide professional context. • OR Demonstrates sound interpersonal but limited scientific communication in a wide professional context.	Early in training • Demonstrates the basics of scientific writing but with some deficiencies. Uses appropriate scientific terminology in oral communication but may lack confidence or a logical approach. Demonstrates an understanding of code-of-conducts in a professional setting. Mid-point in training • Demonstrates proficiency in scientific writing with only minor deficiencies. Mostly confident, articulate, and logical oral scientific communication. Demonstrates reasonable professional communication. Late in training • Demonstrates sound scientific and interpersonal communication in a wide professional context.	Early in training • Demonstrates proficiency in scientific communication and sound professional communication skills. Mid-point in training • Demonstrates sound scientific and professional communication skills. Late in training • Demonstrates exceptional scientific and interpersonal communication skills in a wide professional context.

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Name of document and version: Radiation Oncology Medical Physics (ROMP) Training, Education and Assessment Program (TEAP) Handbook, Version 1.0

Approved by: Radiation Oncology Certification Panel

Date of approval: 23 July 2023

Effective Date: 23 July 2023

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