ACPSEM
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TRAINING EDUCATION & ASSESSMENT PROGRAM (TEAP) HANDBOOK

RADIOPHARMACEUTICAL SCIENCE (RPS)

CONTENTS

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BACKGROUND

Radiopharmaceutical science (RPS) is a multidisciplinary field, encompassing chemistry, physics and biology. It is the science of incorporating a suitable radionuclide into a pharmaceutical or other biologically active molecule in such a way as to enable it to trace or mimic certain in vivo physiological or biochemical processes. The resulting radiopharmaceuticals are used in diagnostic imaging or therapy.

A Radiopharmaceutical Scientist (RPSS) is a specialist professional with a chemistry, pharmacy or sciences background who is involved in the design, manufacture and analysis of radiopharmaceuticals. By utilising their scientific knowledge and analytical skills, the RPSS provides knowledge and guidance on the safe and efficacious use of these products to ensure their suitability for clinical use.

A RPSS has postgraduate qualifications and suitable experience such that they are eligible for admission to the Register of Radiopharmaceutical Scientists administered by the Australian College of Physical Scientists and Engineers in Medicine (ACPSEM). A training, education and assessment program (TEAP), administered by ACPSEM, guides those wishing to enter the specialist field through the required mentored work experience to become eligible for professional certification and consequent registration.

The Radiopharmaceutical Science (RPS) TEAP Curriculum was first developed in 2016 and embraced the Progressive Assessment model of mentored workplace learning (van der Vleuten et al., 2017). The program was developed over the following three years to contain defined graduate program outcome statements (POSs), and standardised models of assessment. For each learning outcome, there were defined assessment tasks and marking guides, to ensure consistency and transparency of assessment. All assessment tasks were made available to the registrars, to ensure that registrars knew what and how they would be assessed against the learning outcomes.

In 2022, members of the Assessor Panel convened to improve the existing program. The Panel's key focus was to reduce duplication of learning outcomes, streamline the program and embed recent advances in evidence-based, programmatic assessment. Expert working groups were formed and conducted a content review and revised the standardised model of assessment to incorporate the latest advances in programmatic assessment described in the literature. These efforts have led to the creation of the RPS TEAP Curriculum Framework and RPS TEAP Handbook.

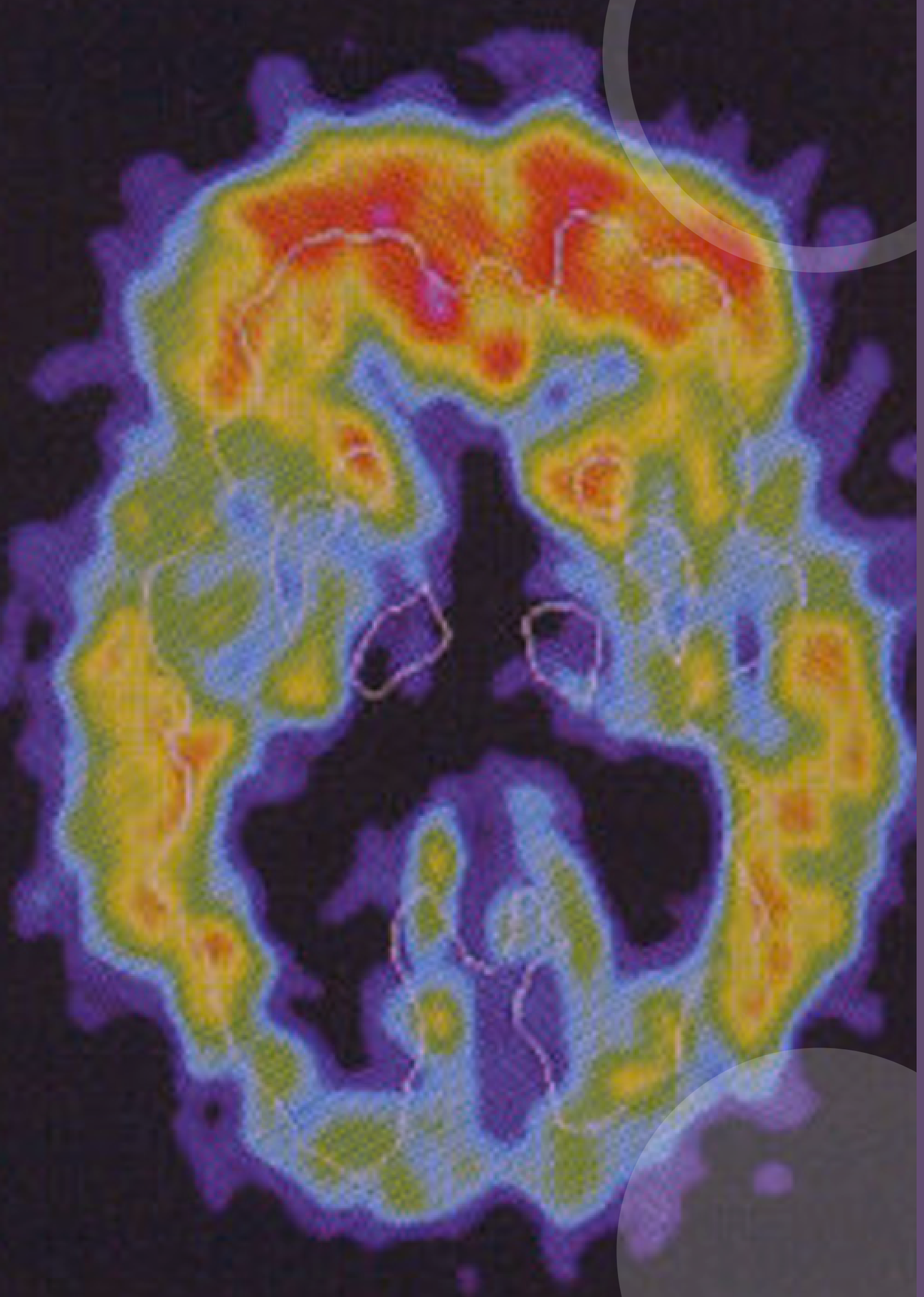
Key changes to the new RPS curriculum include:

- A restructure of learning topics, streamlining the previously described Competencies, and removal of duplication that was present in some areas of the previous program.
- Defined Learning Outcome Statements aligned to identified Graduate Program Outcome Statements across each Key Area of training.
- Domains of Expertise, which classify, teach, and assess fundamental skills that support craft skills across the entire curriculum. These include communication, leadership, health advocacy, professionalism, and collaboration.
- A framework that introduces stages of training; guiding registrars and supervisors to build knowledge in a formatted way, whilst allowing flexibility to meet learning outcomes across the curriculum requirements.

The Curriculum Framework outlines the expected skills, knowledge and understanding required to perform competently as a Clinical Radiopharmaceutical Scientist within Australia.

The Curriculum Framework is a guide for both supervisors and registrars and outlines the learning outcomes deemed 'essential' for professional Certification and Registration. It demonstrates the progressive assessment pathways which will result in the attainment of the learning outcomes deemed essential to work safely in RPS and outlines the way that the learning outcomes are to be assessed in the delivery of the Training, Education and Assessment Program (TEAP).

To those who generously contributed significant time and energy to this new structure, the ACPSEM is truly grateful. The ACPSEM also acknowledges those whose work on versions of the 2016 TEAP curriculum developed the solid foundation that this new RPS TEAP curriculum is built on.



TRAINING PROGRAM OVERVIEW

Training Program Summary

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THE ACPSEM RPS TEAP CONSISTS OF SEVERAL KEY COMPONENTS:

DEGREE PROGRAM

A postgraduate degree program in chemistry, pharmacology, pharmacy or biology relevant to the field of radiopharmaceutical science (Australian Qualification Framework level 9).

This may be completed either during or before enrolment in the RPS 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 RPS TEAP is 3 years full-time equivalent (FTE) in length.

EXTERNAL ASSESMENT

Successful completion of assessment components, which include:

- Submission of written reports and short answer questionnaires as described in the Assessment Tasks
- Practical tasks evidenced by observation or submission of records of completion and entrustment scale ratings, also described in the Assessment Tasks
- Completion of a project, the results of which are presented in a format suitable for publication or presentation.

The ACPSEM RPS TEAP is designed to produce competent, safe-to-practice RPS scientists that have the skills required to work independently in the clinical application of radiopharmaceutical science. It is not expected that graduates are “expert” RPS scientists after a period of only 3 years of clinical training.

The RPS TEAP curriculum framework has been created to guide graduates of the RPS TEAP through a series of prescribed activities such that they reflect the attributes described by Program Outcome Statements (POS) when certified, and then further develop throughout their professional careers. These POS traits have been defined under the following categories:

1. **Safety**
   Work safely within the clinical environment of the radiopharmaceutical science laboratory through the application of evidence-based practice and risk management, in compliance with regulations.
2. **Knowledge**
   Communicate scientific knowledge effectively and demonstrate skills in the core areas of radiopharmaceutical science.
3. **Critical thinking/problem solving**
   Demonstrate critical and analytical thinking, innovative problem solving and evidence-based judgement in a clinical or academic setting.
4. **Communication and teamwork**
   Communicate and collaborate effectively within a multidisciplinary team ensuring the patient and quality of care is the primary focus.
5. **Patient focused**
   Practices patient-centred radiopharmaceutical science with compassion and respect, using ethical and professional values. Understanding the patient is at the core of what we do.
6. **Educator**
   Developing the capability to educate and train others in the functions of the profession.
7. **CPD**
   Demonstrates commitment to ongoing life-long professional development and learning.

Each learning outcome (LO) in the curriculum framework has links to at least one of these graduate program outcome statements (POS), and all program outcome statements are covered across multiple learning outcomes, except for CPD, as this is not currently mandatory in the ACPSEM TEAP but is mandatory once a graduate is listed on the register of qualified radiopharmaceutical scientists upon completion of the RPS TEAP. At all stages in the TEAP, the assessments are explicitly linked to the LOs, enabling both registrars and assessors to see which LOs, and consequently, which POSs, are being assessed. Registrars are assessed by subject matter experts (SMEs) against an established set of criteria to enable consistency and transparency in assessment procedures. These criteria are designed to reflect the attainment of both the learning outcomes and the graduate program outcome statements.

Stages of Clinical Training

The **clinical training component** of RPS TEAP is 3 years (36-months) FTE. 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:

Structured Learning Activities (SLAs) are mandatory as described under Assessment Task. SLAs are specifically mapped to Learning Outcomes, and satisfactory completion of SLAs (along with any ad hoc learning opportunities) allows the registrar to demonstrate they have obtained the skills stated in a Learning Outcome (LO).

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

Evidence Requirements must be collated at each stage.

Progression Markers (PM) must be completed before each Progression Interview (PI). PIs are conducted with representatives of the Certification Panel (CP) at specific time points to ensure the registrar is progressing through the program at an expected rate.

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 (RPS Certification Panel).

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The committee must review all submitted evidence and requirements and make an informed decision about the registrar's progress and competence.

Registrars have flexibility in the attainment of LOs, 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 registrar learning is progressing as required and that clinical training can be completed in the expected timeframe. To complete each stage of training, the registrar should complete all specific Progression Markers within that stage. Where such progression is less than adequate, the CP together with the Training Co-ordinator, will implement strategies to assist the registrar and support them in their learning.

0-12 months

STAGE A: FOUNDATION TRAINING

In this stage, most registrars are entering the world of health professionals 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 RPS scientist 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.

Stages of Clinical Training

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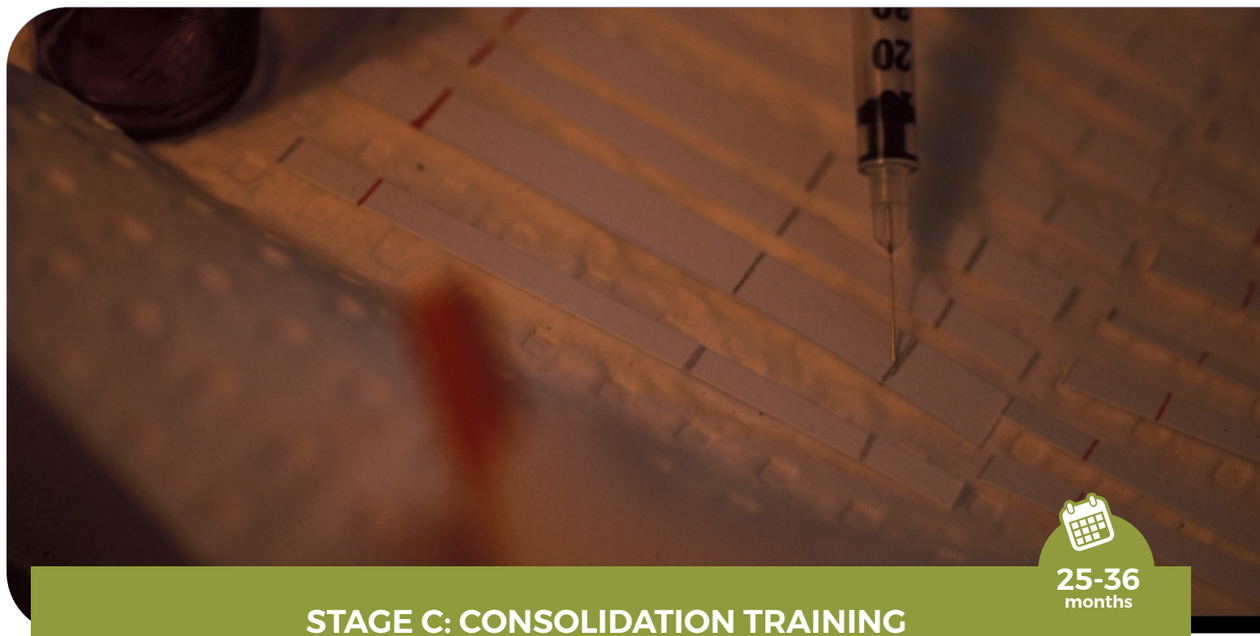
STAGE B: CORE TRAINING

13-24 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 (radiation and chemical safety, analytical procedures, routine manufacture and documentation procedures) that commenced in Stage A should be completed in this stage and be assessed before the end of Stage B. The proficiency of the registrar will increase during Stage B as the registrar becomes more familiar with routine work. This allows the registrar to learn how to lead small projects and contribute to larger projects.

TEAP guides those wishing to enter the RPS specialist field through mentored work experience to become eligible for professional certification.



STAGE C: CONSOLIDATION TRAINING

25-36 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 RPS scientist. It is during Stage C that the registrar ultimately transitions to being a fully functional RPS scientist in their department.

The TEAP curriculum is underpinned by the notions of professional competency and professional standards.

Progression Between Stages

To assist completion of the RPS TEAP within the expected three (3) years, the new curriculum identifies Progression Markers (PM) as activities that must be completed before a Progression Interview (PI).

The PI is conducted at set dates post-enrolment (initially at 6 months, then as a measure of the completion of Stages A, B and C), lead by the Certification Panel (CP), to check the registrar is progressing through the program in such a way that they will be in a position to complete the requirements within the 3 year period. Each PI will include the registrar, the Supervisor, the RPS Training Co-ordinator and a representative of the CP. If expectations are not met, a process of mentoring registrars through TEAP and allowing personalised remediation for registrars experiencing difficulty will be sought to assist the registrar to progress as expected.

Ongoing failure to progress would necessarily result in the issue of a Notice of Concern to the Professional Standards Board (PSB), and the Department Head and Head Radiopharmaceutical Scientist in the department in which the registrar is employed.

Learning Outcomes designated as PMs fall into two categories:

1. Entrustment Activities – Practical activities that the learner must master during training. The activities are graded by the supervisor, relative to a provided matrix, to reflect their level of trust in the registrar being fit to perform the task. It is expected the registrar will grow in competence, and therefore entrustment, over the three years. Many of these activities will be repeatedly required at each PI until the registrar attains the highest level of entrustment, after which they will not be required for future PI.

2. Structured Learning Activities (SLAs) - A small number of 'critical path' LOs have been identified, to make sure that submissions are being made in a timely way, but also cognizant of not imposing too much order on the way the training is imposed. The LO chosen should reflect essential base knowledge that is critical to the learning path. Although there is flexibility for the training site to work within its constraints, the specific progression markers mentioned in Table 1 must be attained before progression between stages.

   A description of what needs to be completed for the respective PI is provided in Table 1. For more detail on Entrustment Activity levels, please refer to page 32.

PROGRESSION INTERVIEW NUMBER	ENTRUSTMENT ACTIVITIES	STRUCTURED LEARNING ACTIVITIES
Progression Interview #1 **(6 months)**	• Entrustment Activities do not need to be completed before this interview.	• Four SLAs from KA1 need to be completed before this interview (LO 1.1.1, 1.2.1, 1.3.1, 1.3.2) along with the theoretical knowledge around the nature of radioactivity and chemical safety from KA2 (LO 2.1.1 and the SAQs of LO 2.5.1).
Progression Interview #2 **(as part of the completion of Stage A, 12 months)**	• All Entrustment Activities for KA3, KA4 and KA6 are expected to be at Level 2, and KA5 activities should be started.	• All SLAs from KA1 need to be completed before this interview, more progress should be made on the LOs from KA2, and the LOs from KA6 and KA8 should be started.
Progression Interview #3 **(as part of the completion of Stage B, 21 months)**	• All Entrustment Activities for KA3, KA4, KA5 and KA6 are expected to be at Level 3.	• All SLAs from KA4 need to be completed before this interview, and the LOs from KA5 and KA9 should be started.
Progression Interview #4 **(as part of the completion of Stage C, 30 months)**	• All Entrustment Activities for KA3, KA4, KA5 and KA6 are expected to be at Level 4.	• All SLAs nominatedmust to be completed before this interview (Safe to Practice Interview (STPI)).

Table 1: Shows the Progression Markers (Structured Learning Activities and Entrustment Activities) that need to be completed before Progression Interviews

Radiopharmaceutical Science (RPS) Training Education and Assessment Program (TEAP) Summary

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

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

Stage C: Consolidation (months 5 – 36) approx. 12-month duration

24-36 months

Stage C:

Structured Learning Activities	Presentations, Formal Reports, Reflective practice, Practical experiences, Literature reviews, Entrustment activities
***Ad hoc* Learning Opportunities**	All ad hoc learning opportunities are recommended
Evidence Requirements	Entrustment ratings, Records, Formal Reports & Presentations
Hurdle Requirements	Progress Interview (PI) 4, Formal Reports, all Learning Outcomes attained, & Safe to Practice Interview

Progression (high-stakes committee decision)

Stage B: Core (months 12 – 24) approx. 12-month duration

9-30 months

Stage B:

Structured Learning Activities	Reflective practice, Literature reviews, Practical experiences, Entrustment activities
***Ad hoc* Learning Opportunities**	All ad hoc learning opportunities are recommended
Evidence Requirements	Entrustment ratings, Records, Practical assessments, Written Reports & SAQs, Formal reports
Hurdle Requirements	Progress Interview (PI) 3, All Progression Markers 3.

Progression (high-stakes committee decision)

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

0-12 months

Stage A:

Structured Learning Activities	Induction requirements, Literature reviews, Reflective practice, Entrustment activities
***Ad hoc* Learning Opportunities**	Education sessions, Informal discussions, Inter-site visits
Evidence Requirements	Entrustment ratings, Records, Written Reports & SAQs
Hurdle Requirements	Progress Interview (PI) 1 & 2, All Progression Markers 1 & 2.

Entry into RPS TEAP
Eligibility criteria & selection tools

Increasing RPS Competence

Figure 1: Diagrammatic summary of the RSP TEAP requirements

*Evidence requirements are specified (including frequency) for different stages of training
*Examples of ad hoc Learning Opportunities (non-mandatory) are suggested for different stages of training.

*Structured Learning Activities (mandatory) detail number required at different stages of training
*PIs are required within a stage of training to monitor progress

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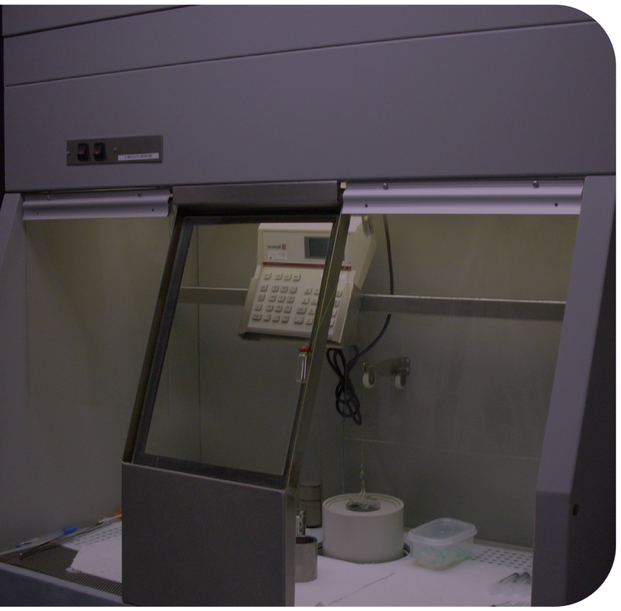
Professional Competency is considered to be made up of the attributes knowledge, skills and attitudes. It represents the ability to perform tasks to the standard expected in employment. In general, learning outcomes state what a learner is expected to know, and a competency explains how they should know it (Santacaterina, 2007).

EDUCATION AND ASSESSMENT FRAMEWORK

Educational Principles

In RPS TEAP, the ACPSEM has implemented assessment standardisation through the introduction of marking guides and specialist assessors who are Subject Matter Experts (SMEs) for each Learning Outcome. Also included is a changed format (e.g. replacing written reports with short-answer questionnaires (SAQs) and information that guides the registrar on expected submission length, again to reduce non-meaningful and burdensome assessment. This is achieved through the application of a model of programmatic assessment that applies a holistic view of performance across multiple assessment data points (see Figure 2). This model recognises that as competency develops over time, the 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 data point contributes to the evidence base for determining competence. Progression decisions are not made solely on the basis of one assessment instrument (such as an exam). Instead, the accumulated evidence is reviewed by a committee (Certification Panel (CP)) 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 RPS TEAP, most 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). For example, 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 data point contributes to the evidence base for determining competence. The 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 of 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. High-stakes decisions (such as progression between stages) should be based on a 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 (CP).

Education and Assessment Framework

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

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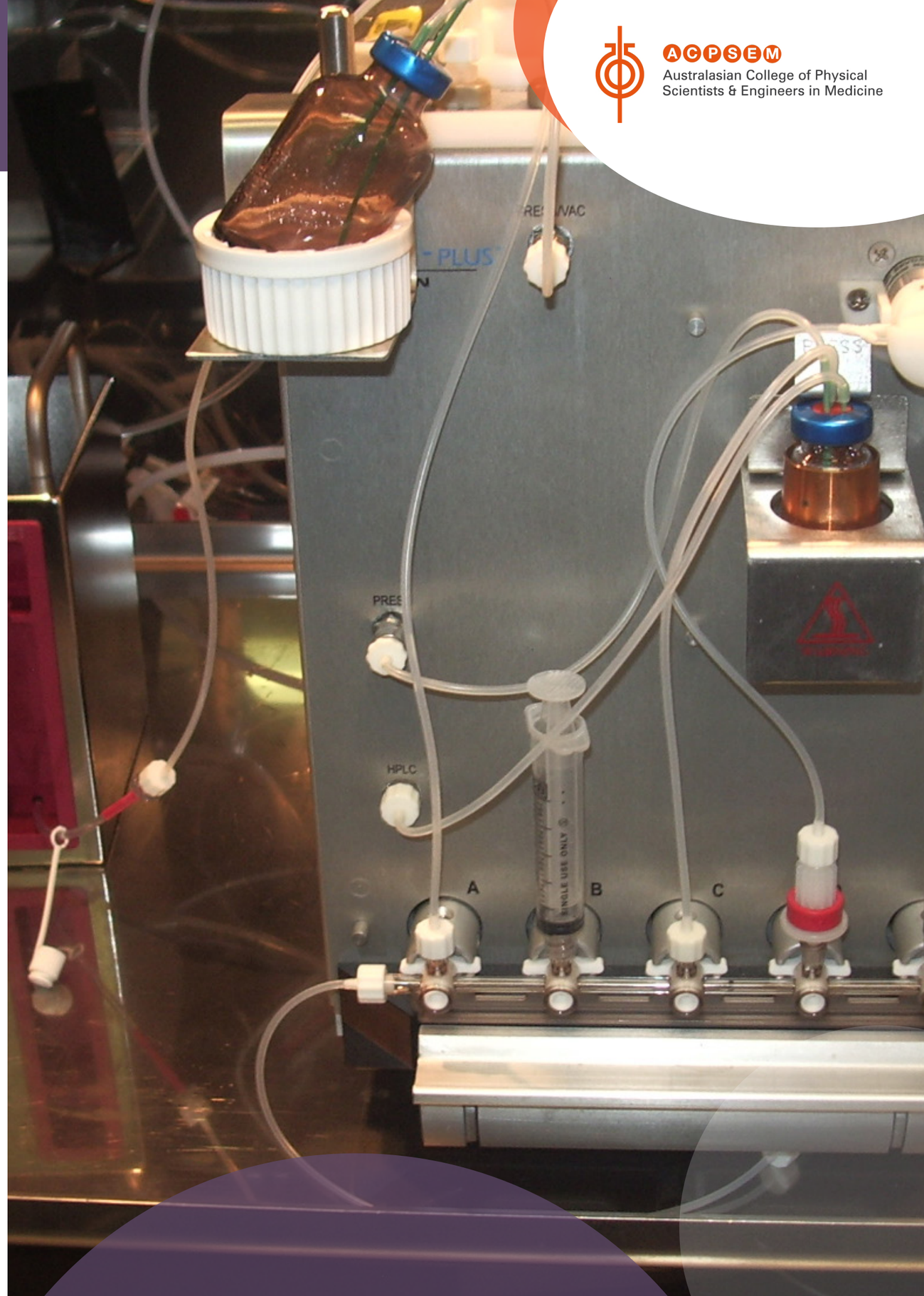

Education and Assessment Framework

In programmatic assessment, each individual assessment data point 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 is generated by the learning activities, both mandatory structured activities and non-mandatory ad hoc learning opportunities (of which those listed are only examples). Types of evidence required are identified in the Assessment Task within Alex, the ACPSEM Learning Management System (LMS).

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

By utilising their scientific knowledge and analytical skills RPSS also provide knowledge and guidance on the safe and efficacious use of these products to ensure their suitability for clinical use.

Education and Assessment Framework

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RPS Programmatic Assessment Evidentiary Framework

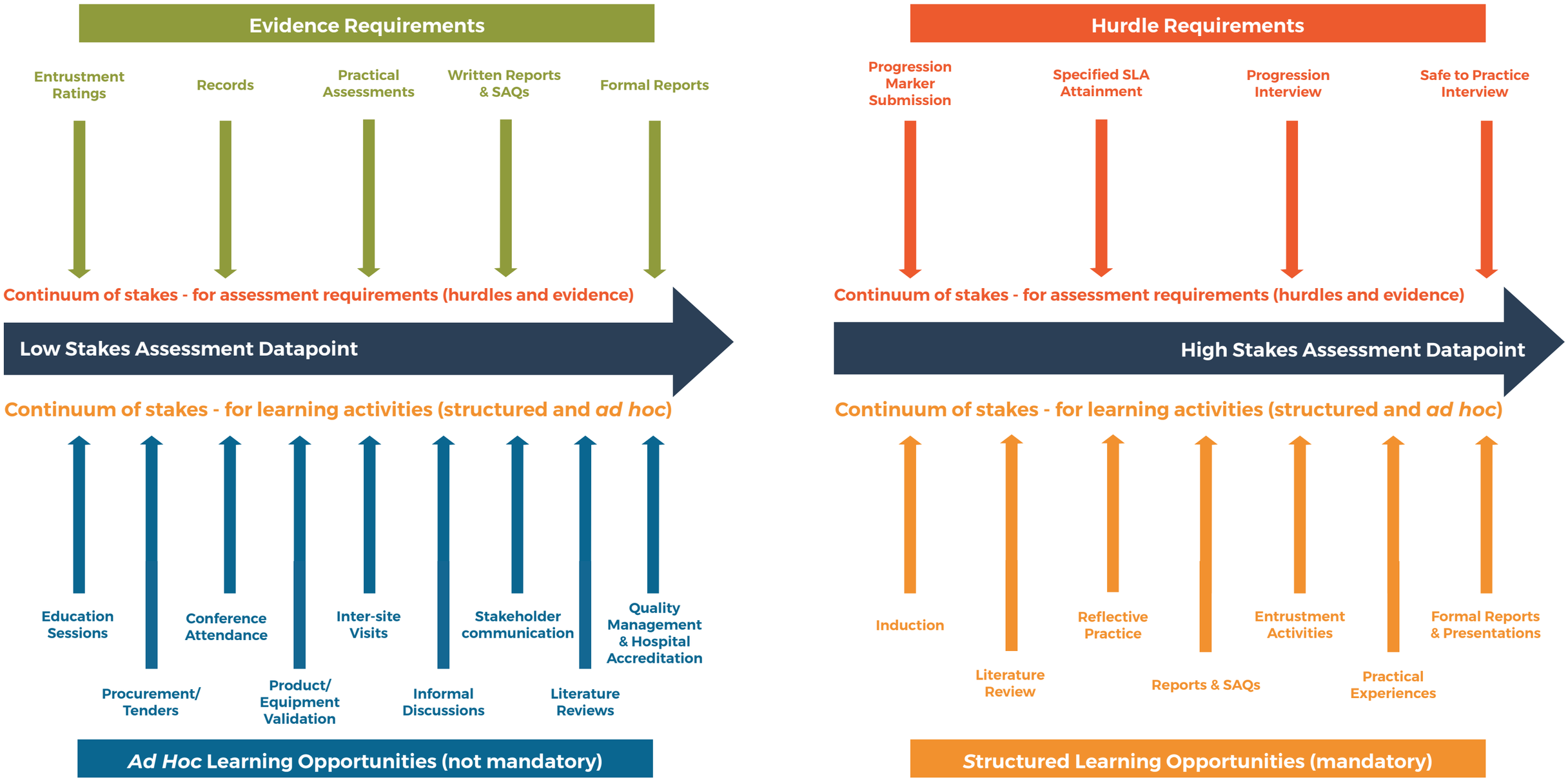
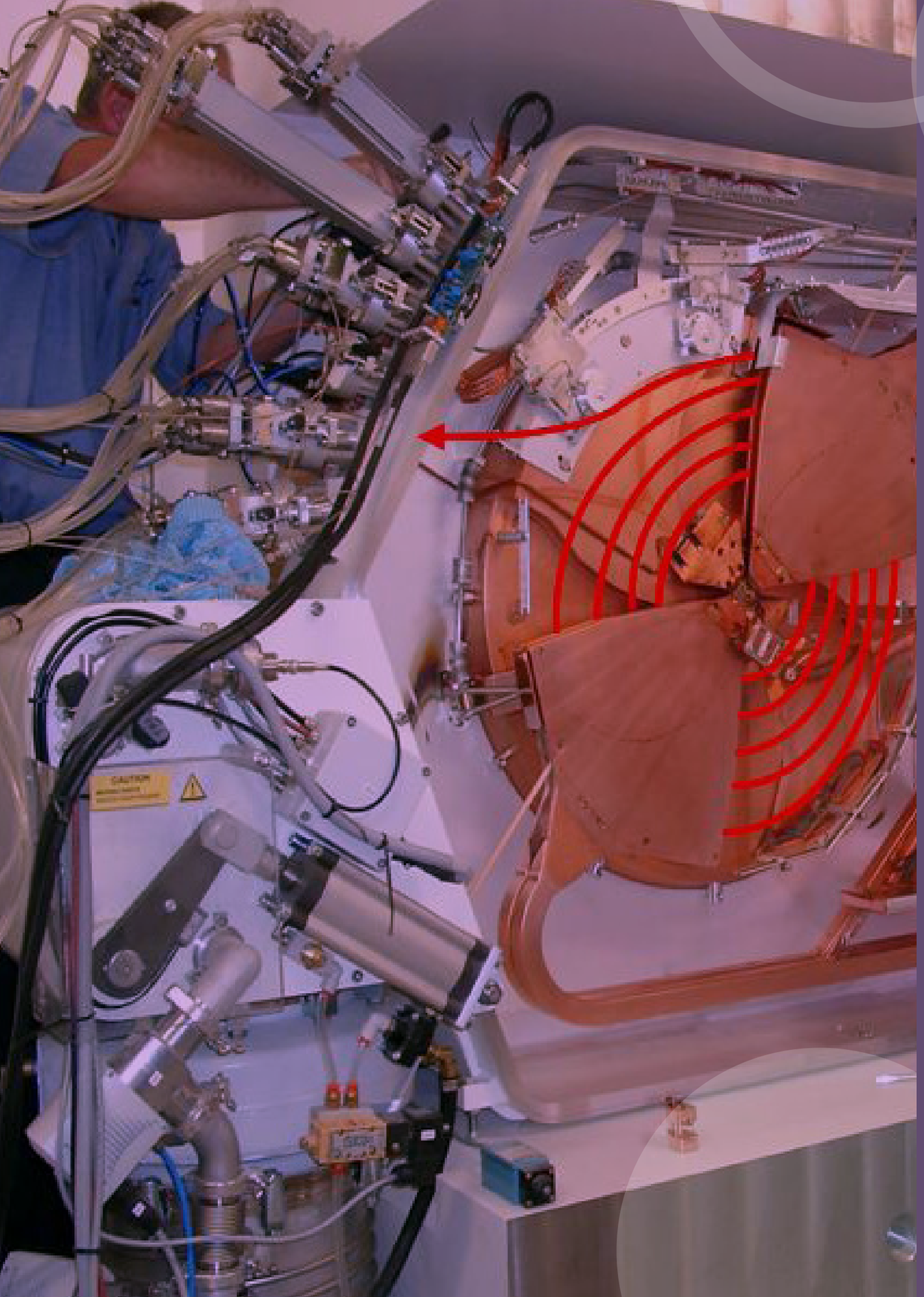


Figure 2: RPS Programmatic Assessment Evidentiary Framework

- In Programmatic Assessment, each individual assessment datapoint contributes to the evidence base for determining competence.
- Accumulated evidence is reviewed by expert committees when making high-stakes decisions (i.e., progression, certification).
- Evidence can be generated from the following datapoints:
  - Both higher stakes hurdle requirements and lower stakes evidentiary requirements
  - Accumulated evidence is reviewed by expert committees when making high-stakes decisions (i.e., progression, certification).
  - Learning activities, both mandatory structured activities and non-mandatory ad hoc learning opportunities (of which the above are only examples).



STRUCTURED LEARNING ACTIVITIES AND ASSESSMENT METHODS

Assessment Evidence

The RPS registrar is an adult learner, engaged in a mentored workplace training program. The RPS TEAP program is an experiential learning program (Kolb 1984) that aims to provide experiences and opportunities which are personally meaningful to the goals of the adult learner, who is aiming to establish a pre-professional identity by developing awareness of, and connection with, the skills, qualities, behaviours, values, and standards of the registrar's chosen profession.

One important aspect of experiential learning is engaging in as many of the senses as possible during the training activity to embed the knowledge and/or skill. One example is attending PET and SPECT reporting sessions (hear). Other examples include performing the task many times until it integrates into 'muscle memory' (touch).

Structured learning activities (SLA) are those learning activities with instructions that the registrar can follow, or modify as required to suit the institution, which describes how the registrar can develop their competence in a LO. It is reasonable to expect a LO to recommend a number of SLAs that may have practical, written and entrustment components. The nature of the SLAs has been chosen as they support the best evidence formats for assessing the attainment of a LO. Therefore, for each Learning Outcome there are prescribed SLA(s) and expected assessment evidence identified within the LMS (see the 'Mapping between Learning Outcomes and Assessment Evidence' presented in Appendix 1).

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There are six categories of assessment evidence formats:

Short Answer Questionnaires (SAQs) are specific questions on a topic that will usually cover several elements. An answer is expected to be a maximum of 1-2 paragraphs in length. A single SAQ should be able to be completed in less than 1 hour as an open book exercise, although there is no time limit, this is a guide only.

Written Reports are longer explanations of a topic. It may cover more than one element. The maximum page length (1-5) is nominated in the Assessment Task to guide the learner about the amount of detail expected.

Records are suitable pieces of evidence that the learner can upload. These are records generated as a result of, and during the course of, their normal clinical work which demonstrate their involvement in the completion of that task. Examples include batch preparation records, gowning qualification or batch release forms. On occasion, they may be asked to annotate the record with comments about the record or components such as identifying the source of data, commenting on the quality or meaning of data or a result within the record.

Practical Assessments are a series of prescribed practical tasks, assessed with eyes-on assessment by the supervisor or other nominated assessor, graded against a rubric describing expectations.

Formal Reports are produced in a format suitable to the project purpose. Examples include a scientific presentation or publication, a risk assessment or a validation report. The learner is required to provide an in-depth study, including experimental data, analysis and recommendations arising from the findings. It differs from the written report by requiring data generated by the learner.

Assessment Evidence

Entrustment Ratings are a predefined rubric from which the Supervisor will select the most appropriate statement(s) to describe the ability of the registrar to independently undertake the activity. These statements determine which one of four levels best describes the competence of the registrar at the point in time the assessment is made. Assessments will be repeated over the course of the training period as markers of progression from requiring constant supervision to becoming a completely independent professional. These activities and ratings are used by the Certification Panel in their regular assessment of registrar progress.

ENTRUSTMENT RATING SCALE FOR RPS TEAP

LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4
Constant Direct Supervision	**Direct Supervision**	**Minimal Direct Supervision**	**Direct Supervision Not Required**
Supervisor (or equivalent) is directly observing Registrar work	Supervisor is immediately available, and needs to check Registrar's work progressively and at completion	Supervisor is readily contactable, may need to review Registrar's work at completion	Supervisor is available but doesn't need to check Registrar's work

CLINICAL INDUCTION TO RPS

During Stage A of the RPS TEAP, there is an expectation that clinical departments will provide registrars with the routine hospital induction processes and integrate them as functional members of staff. Such activities are designed to introduce the new registrar to the clinical foundations of RPS and the role that the RPSS plays in the patient experience. 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.

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The required evidence has been determined by professional standards where these relate to systems, procedures and information used by individuals to achieve a level of conformity and uniformity for a given practice. The evidence required seeks to ensure that knowledge and skills acquired are executed to a level of consistency identified for the delivery of a quality service.

AD HOC LEARNING OPPORTUNITIES

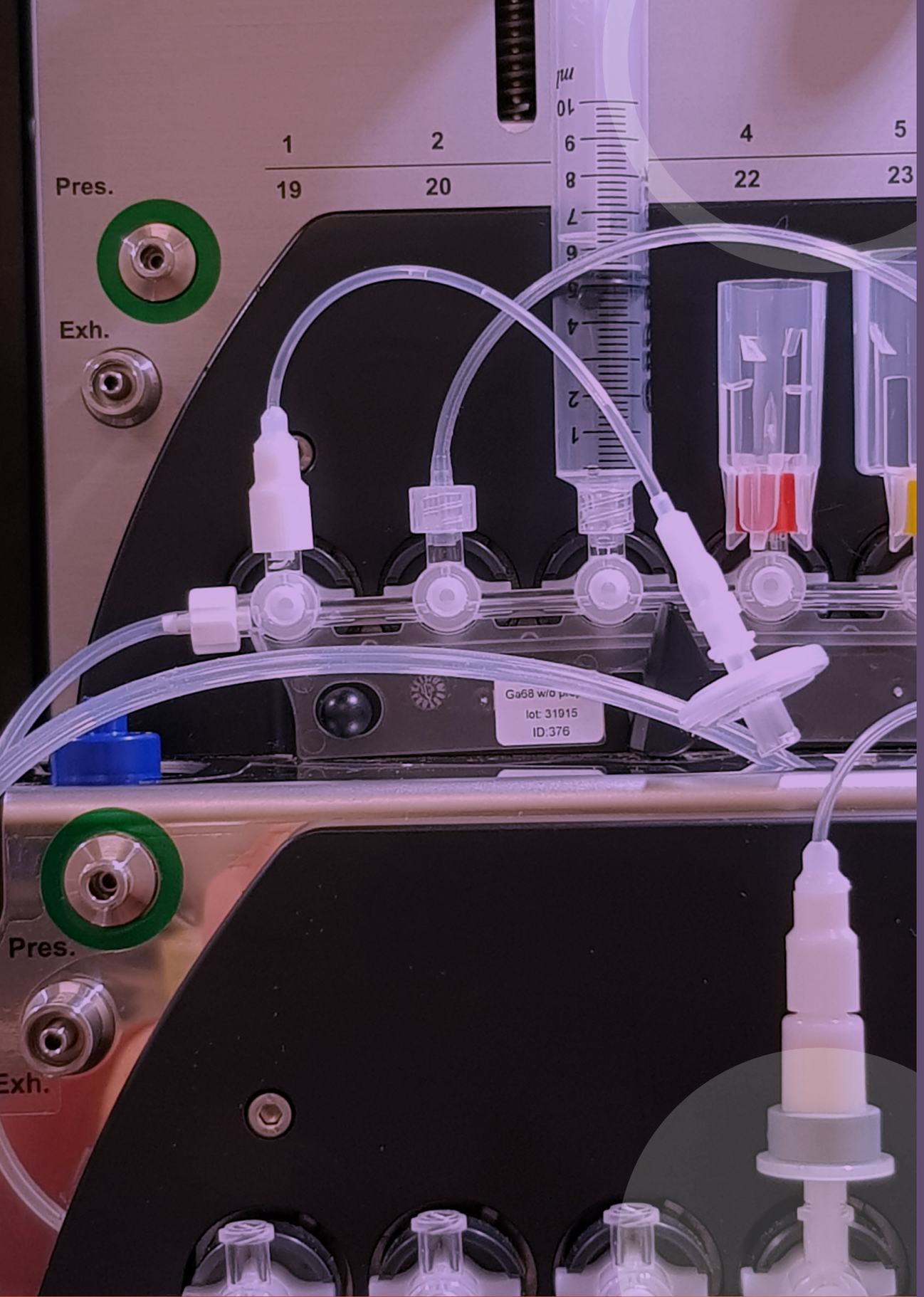
Ad Hoc Learning Opportunities

Ad Hoc Learning Opportunities are activities that can contribute significant understanding and competence to the learner if available during the period of their enrolment. Examples include attendance at education sessions, seminars, conferences, a literature review, inter-site visits, or commissioning of new equipment, however activities are not limited to these. Evidence is supplied by submitting a Reflective Report which must demonstrate active participation in the activity, or a Certificate of Attendance.

Reflective Reports are the registrar's written personal reflections on the activity or opportunity encountered. Where appropriate it must contain a statement about the level of participation of the registrar, acknowledged by a suitably senior person.

The patient is at the centre of what we do.

Learning activities have been designed so Registrars can demonstrate achievement of LOs. The key competencies expected from the RPS training program have been articulated in the LOs.



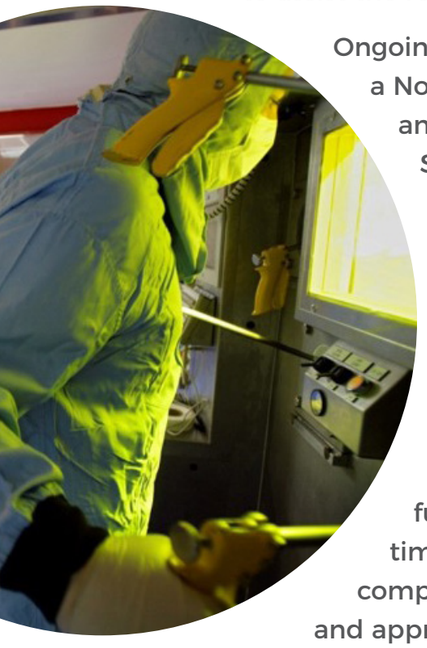
HURDLE REQUIREMENTS

Hurdle Requirements

There are several “hurdles” that must be successfully completed at various points throughout the RPS TEAP which monitor progress. These “hurdles” are described in Figure 1, and consist of the completion of Progression Markers, Progression Interviews and at the end of Stage C, the Safe to Practice interview. These hurdles form a standardised method of assessing registrar progress and are conducted by experts outside of the registrar’s training department. Providing a wider assessment environment is in keeping with Australian Medical Council (AMC) guidelines and international registration body recommendations.

Progression Interviews

Progression Interviews (PI) are conducted at set dates post-enrolment (initially at 6 months, then as a measure of the completion of Stages A, B and C), led by the Certification Panel (CP), for the purpose of checking the registrar is progressing through the program in such a way that they will be in a position to complete the requirements within the 3-year period. Each PI will include the registrar, the Supervisor, the RPS Training Co-ordinator and a representative of the CP. An example of the Progression Interview rubric used to assess the PI, is provided in Appendix 2. If expectations are not met, a process of mentoring registrars through TEAP and allowing personalised remediation for registrars experiencing difficulty will be sought to assist the registrar’s progress as expected.



Ongoing failure to progress would necessarily result in the issue of a Notice of Concern to the Professional Standards Board (PSB), and the Department Head and Head Radiopharmaceutical Scientist in the department in which the registrar is employed.

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

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

Routine meetings also provide an opportunity for the registrar to ask questions, clarify or learn, and 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.

The Final Hurdle – The Safe to Practice Interview

The final hurdle to meet for the transition from Stage C to Certification is passing the Safe to Practice Interview (STPI).

When all SLAs have been submitted and graded, an STPI will be conducted between the registrar and an interview panel consisting of a member of the Certification Panel (Chair), and two senior Assessors.

At least five (5) days prior to the interview, the registrar will be given a set of at least five (5) questions which they will be expected to discuss with the panel members. The questions will challenge perceived weaknesses in knowledge and application, but will also seek to determine that attitudes and attributes are consistent with the expectations of a certified Radiopharmaceutical Science Specialist.

Following the STPI, the panel will prepare a recommendation report for approval by the full Certification Panel, which is then sent to the Professional Standards Board (PSB) for ratification of the decision.

Provided the report recommends Certification, upon acceptance of the report, the registrar is awarded ‘Certification in the Specialty of Radiopharmaceutical Science’ and admitted to the “ACPSEM Register of Qualified Medical Physics Specialists

Hurdle Requirements

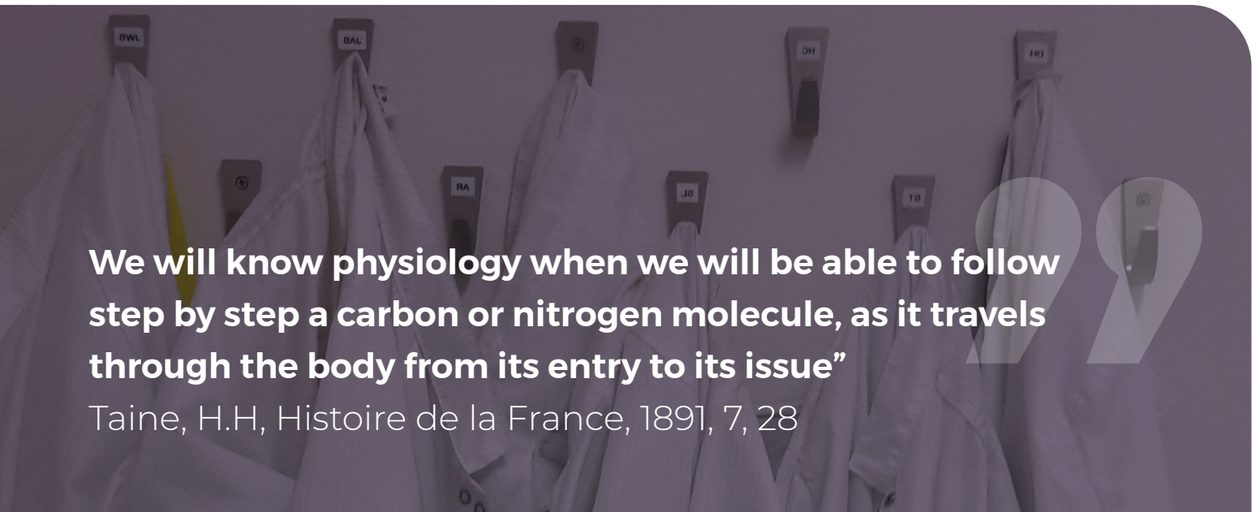
and Radiopharmaceutical Scientists (The Register)'. In the event the report did not recommend Certification, a Progression Interview would be convened and the registrar offered every assistance to address the gaps identified at the interview.

Remediation Pathways

The ACPSEM recognizes 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: May be submitted at any time to the ACPSEM by a TEAP Coordinator, Preceptor, Supervisor or other authorised RPSS to recommend consideration of remediation for a registrar who, on balance, is at risk of not meeting RPS TEAP requirements. It provides a means of reviewing the 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 through the Progression Interview. In this instance, a Remediation Plan will be developed that clearly outlines the requirements for progression and the expected timeframe for completion.



We will know physiology when we will be able to follow step by step a carbon or nitrogen molecule, as it travels through the body from its entry to its issue"

Taine, H.H, Histoire de la France, 1891, 7, 28


LOWER BOX
NEGATIVE
PRESSURE
LAB PRESSURE
REF
MAGNEHELIC
TIGHTNESS
TEST PLUG
PRESSURE REG.
POWER SUPPLY
PROBE
GAS PRESSURE
COMECER

APPENDICES

Appendix 1: Mapping between Learning Outcomes and Assessment Evidence

The RPS TEAP programmatic assessment model incorporates specific evidence requirements based on the type of Structured Learning Activity. The following Table maps each Learning Outcome to prescribed forms of Assessment Evidence, where:

SAQ are specific questions on a topic that will usually cover several elements. An answer is expected to be a maximum of 1-2 paragraphs in length. A single SAQ should be able to be completed in less than 1 hour as an open book exercise, although there is no time limit, this is a guide only.

Written Reports are longer explanations of a topic. It may cover more than one element. The maximum page length (1-5) is nominated in the Assessment Task to guide the learner about the amount of detail expected.

Practical Assessments are a series of prescribed practical tasks which will be assessed with eyes-on assessment by the supervisor or other nominated assessor, graded against a rubric describing expectations.

Records are suitable pieces of evidence the learner can upload. These are records generated as a result of, and during the course of, their normal clinical work which demonstrate their involvement in completion of that task. Examples include batch preparation records, gowning qualification or batch release forms. On occasion they may be asked to annotate the record with comment about the record or components such as identifying the source of data, comment on the quality or meaning of data or a result within the record.

Formal Reports which should be in a format suitable to the project purpose. Examples include a scientific presentation or publication, a risk assessment or a validation report. The learner is required to provide an in-depth study, including experimental data, analysis and recommendations arising from the findings. It differs from the written report by requiring data generated by the learner.

Entrustment Ratings are a predefined rubric from which the Supervisor will select the most appropriate statement(s) to describe the ability of the registrar to independently undertake the activity. These statements determine which one of four levels best describes the competence of the registrar at the point in time the assessment is made. Assessments will be repeated over the course of the training period as markers of progression from requiring constant supervision to becoming a completely independent professional. These activities and ratings are used by the Certification Panel in their regular assessment of registrar progress.

Ad Hoc Learning Activities are activities which can contribute significant understanding and competence to the learner if available during the period of their enrolment. Examples include attendance at Education Sessions, seminars, conferences, a literature review, inter-site visits, commissioning of new equipment, but activities are not limited to these. Evidence is supplied by submitting a Reflective Report which must demonstrate active participation in the activity, or a Certificate of Attendance.

Reflective Report require registrars to write their own personal reflection on the activity or opportunity encountered. Where appropriate it must contain a statement about the level of participation of the registrar, acknowledged by a suitably senior person.

Appendices

	Learning Outcomes	Assessment Evidence
KEY AREA 1: Induction to clinical radiopharmaceutical science		
TOPIC 1.1	**Education**	
LO 1.1.1	Complete relevant undergraduate and postgraduate education	**Records**
TOPIC 1.2	**TEAP**	
LO 1.2.1	Enroll in TEAP	**Records**
TOPIC 1.3	**Induction activities**	
LO 1.3.1	Complete relevant inductions (department, radiation safety, hospital induction)	**Records** **Reflective Report**
LO 1.3.2	Explain the tracer principle	**SAQ**
LO 1.3.3	Reflect on the importance of SPECT imaging	**SAQ**
LO 1.3.4	Reflect on the importance of PET imaging	**SAQ**

	Learning Outcomes	Assessment Evidence
KEY AREA 2: Radiation & chemical safety		
TOPIC 2.1	**Nuclear physics and instrumentation**	
LO 2.1.1	Describe the nature of radioactivity	**SAQ**
LO 2.1.2	Explain the principles and demonstrate skill in the operation of radiation detectors	**SAQ** **Practical Assessments**
LO 2.1.3	Explain and apply the concept of radioactive decay	**SAQ**
TOPIC 2.2	**Biological effects of ionising radiation**	
LO 2.2.1	Explain the models applicable to radiation effects	**SAQ**
LO 2.2.2	Describe how exposure to ionising radiation is quantified	**SAQ**
LO 2.2.3	Explain how exposure to ionising radiation can induce biological effects	**SAQ**
TOPIC 2.3	**Regulatory framework governing the use of radiation in medicine**	
LO 2.3.1	Explain the principles behind the international system of radiation protection and how it is applied in the workplace	**SAQ**
LO 2.3.2	Demonstrate understanding of local Radiation Management Plan	**SAQ**
LO 2.3.3	Demonstrate knowledge of codes of practice governing the packaging and transport of RP	**SAQ** **Written Reports** **Ad Hoc Activity**

	Learning Outcomes	Assessment Evidence
KEY AREA 2: Radiation & chemical safety		
TOPIC 2.4	**Management of radiation safety**	
LO 2.4.1	Competent to handle radioactive materials in the workplace	Practical Assessments Records Entrustment Ratings
TOPIC 2.5	**Management of chemical safety**	
LO 2.5.1	Demonstrate competence in chemical safety	SAQ Entrustment Ratings
TOPIC 2.6	**Evaluation of chemical and radiation safety**	
LO 2.6.1	Ability to evaluate risk in the radiopharmaceutical science laboratory	Records
Key Area 3: Application of analytical techniques		
TOPIC 3.1	**Basic laboratory practice**	
LO 3.1.1	Identify basic laboratory equipment and processes used in the RPS laboratory	SAQ
TOPIC 3.2	**Laboratory skills relevant to the radiopharmaceutical laboratory**	
LO 3.2.1	Use and apply simple laboratory and analytical techniques	Practical Assessments Entrustment Ratings
LO 3.2.2	Describe sterility and bacterial endotoxin laboratory and analytical techniques	SAQ
LO 3.2.3	Use and apply advanced laboratory and analytical techniques	Practical Assessments Records Ad Hoc Activity
LO 3.2.4	Evaluate experimental results of chemical analysis	Written Reports Records
Topic 3.3	**Method development/improvement**	
LO 3.3.1	Establish a new analytical method, or evaluate an existing analytical method used in the quality control testing of a radiopharmaceutical	Records Formal Report
Key Area 4: Radionuclide production		
Topic 4.1	**Methods of radionuclide production**	
LO 4.1.1	Describe each of the methods of radionuclide production and explain how they are applied in radiopharmaceutical science	SAQ Written Reports
LO 4.1.2	Explain the principles of the $^{99}Mo/^{99m}Tc$ and $^{68}Ge/^{68}Ga$ generators. Supply evidence of experience and competence in the use of the generators	SAQ Records Entrustment Ratings
LO 4.1.3	Experience in cyclotron operations	Written Reports Practical Assessments Records
Key Area 5: Aseptic preparation & quality risk management		
TOPIC 5.1	**Regulations, Codes, Standards and Guidelines that apply to the practice of radiopharmaceutical science**	
LO 5.1.1	Has knowledge of the Legislation, Codes and Regulations by which the Radiopharmaceutical Scientist (RPS) must abide by	SAQ Written Reports

Appendices

	Learning Outcomes	Assessment Evidence
LO 5.1.2	Apply and interpret resources to ensure product quality and safety	Written Reports
TOPIC 5.2	**The PQS - Quality management in the practice of radiopharmaceutical science**	
LO 5.2.1	Design and implement a Pharmaceutical Quality System (PQS) suitable for use in a hospital-based radiopharmaceutical production facility	Entrustment Ratings Formal Report
TOPIC 5.3	**The facilities, equipment and processes employed to create a manufacturing environment**	
LO 5.3.1	Identify the facilities, equipment and processes used in sterile manufacture	SAQ Written Reports
LO 5.3.2	Validate competency in performing tasks in a clean room environment	Written Reports Entrustment Ratings
Topic 5.4	**Application of Quality Risk Management (QRM) in a radiopharmaceutical manufacturing environment**	
LO 5.4.1	Explain the processes used in the management of risk (QRM) within a pharmaceutical production laboratory	Written Reports Formal Report
LO 5.4.2	Conduct an investigation into a manufacturing deviation or incident	Formal Report
LO 5.4.3	Apply the Change Control process to manufacturing situations	Written Reports
LO 5.4.4	Display skill and judgement in application of QRM to the radiopharmaceutical manufacturing environment	Entrustment Ratings
Key Area: 6 - Preparation of diagnostic & therapeutic radiopharmaceuticals		
Topic 6.1	**The use of radiopharmaceuticals in medicine**	SAQ Written Reports

	Learning Outcomes	Assessment Evidence
LO 6.1.1	Describe the application of radiochemistry to medicine	
LO 6.1.2	Explain the application of radiochemistry to therapy (TRNT)	SAQ
TOPIC 6.2	**The chemical basis for the incorporation of a radionuclide into a molecule**	
LO 6.2.1	Describe the chemistry of radiolabelling with Carbon-11	Written Reports
LO 6.2.2	Describe the chemistry of radiolabelling with the halogens	Written Reports
LO 6.2.3	Describe the chemistry of radiolabelling with radiometals	Written Reports
TOPIC 6.3	**Preparation of radiopharmaceuticals**	
LO 6.3.1	Describe synthetic processes	SAQ
LO 6.3.2	Explain radiopharmaceutical formulation and its purpose	Written Reports
TOPIC 6.4	**Specific examples of radiopharmaceutical preparation**	
LO 6.4.1	Prepare SPECT radiopharmaceuticals	Written Reports

	Learning Outcomes	Assessment Evidence
LO 6.4.2	Prepare PET radiopharmaceuticals	Written Reports
LO 6.4.3	Prepare Therapeutic radiopharmaceuticals	Written Reports
LO 6.4.4	Utilise an automated module for the synthesis of a radiopharmaceutical	SAQ Practical Assessments
LO 6.4.5	Describe the specific requirements or conditions required when radiolabelling proteins and peptides, cells/blood components, other biological entities	SAQ
LO 6.4.6	Independently prepare a range of radiopharmaceuticals	Written Reports Entrustment Ratings
Topic 6.5	**Quality control/analysis of radiopharmaceuticals preparation**	
LO 6.5.1	Describe the parameters used to define radiopharmaceutical quality	Written Reports
LO 6.5.2	Explain how radiopharmaceutical quality is assessed	Written Reports
Topic 6.6	**Management of radiopharmaceutical quality in line with the PQS.**	
LO 6.6.1	Management of radiopharmaceutical quality in line with the PQS.	Written Reports Entrustment Ratings Formal Report
Key Area 7: Radiopharmaceutical development		
Topic 7.1	**Use molecular imaging to probe metabolic processes**	
LO 7.1.1	Probe biochemical and metabolic processes using radiopharmaceuticals	SAQ

	Learning Outcomes	Assessment Evidence
TOPIC 7.2	**Designing a radiopharmaceutical for clinical use**	
LO 7.2.1	Undertake preliminary design of a new radiopharmaceutical, including establishing quality criteria.	SAQ
TOPIC 7.3	**Validation of a new radiopharmaceutical**	
LO 7.3.1	Validate all the processes involved in the synthesis of a new radiopharmaceutical	Records Formal Report
Key Area 8: Research Capability		
LO 8.1	**Research Capability**	
LO 8.1.1	Undertake independent research	Written Reports Formal Report
Key Area 9: The professional radiopharmaceutical scientist		
LO 9.1	**Apply professionalism to clinical practice of radiopharmaceutical science**	
LO 9.1.1	Define professionalism and its application to radiopharmaceutical science practice	Reflective Report
LO 9.1.2	Practice Patient Centred Radiopharmaceutical Science Practice	Reflective Report
LO 9.1.3	Communicate as a professional Radiopharmaceutical Science Specialist	Records
LO 9.1.4	Participate in Radiopharmaceutical Science Communities of Practice	Entrustment Ratings

Appendix 2: Progression Interview Rubric Assessment Evidence

	FALLS WELL SHORT OF EXPECTATIONS	FALLS SHORT OF EXPECTATIONS
(i) Knowledge of radiopharmaceutical science principles	Early in training • Demonstrates significant gaps in breadth or depth of knowledge of basic RPS 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 RPS principles. Mid-point in training • Demonstrates some gaps in 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
(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 an 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.
(iii) 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
(iv) Clinical RPS 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
(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.

	MEETS EXPECTATIONS	EXCEEDS EXPECTATIONS
(i) Knowledge of radiopharmaceutical science principles	Early in training • Demonstrates the ability to explain basic RPS 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 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.
(iii) Application of relevant theory to clinical situations	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 • Demonstrates in practice the ability to lead developmental projects or critical reviews.
(iv) Clinical RPS judgment and responsibility	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 • 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.

Image References

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