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Competency Mapping As a Strategic Tool for Workforce Sustainability In a Large Radiation Oncology Physics Program

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ABSTRACT

Medical physics departments are facing increasing challenges related to workforce aging, an upcoming wave of retirements, and the growing complexity of clinical tasks and required competencies. In large radiation oncology centers, ensuring continuity of care and maintaining high-quality, safe treatments requires not only sufficient staffing levels but also appropriate distribution and redundancy of competencies within the team. This work describes the development and implementation of a structured competency mapping exercise.

In the fall 2025, a competency mapping tool was developed using a list of medical physics competencies, largely derived from the COMP competency profile and adapted to the local clinical context. As part of the annual performance review process, a survey was distributed to all medical physicists in the department. For each competency, participants were asked to: (1) self-assess their current level of competency, (2) identify competencies they would like to further develop, and (3) provide their opinion on the importance of having redundancy for that competency within the team. Survey results were analyzed to determine the number of physicists required for each competency based on a risk-informed approach considering task criticality, frequency, and acceptable delay before task completion.

The analysis enabled identification of competencies with insufficient coverage or redundancy, highlighting areas of elevated operational risk. Competencies at risk were prioritized based on clinical impact and vulnerability to staff absences or retirements. The exercise also facilitated the identification of targeted training needs, succession planning priorities, and potential contingency measures to mitigate short- and medium-term risks.

This competency mapping provides a practical, adaptable tool for strategic workforce planning. The competency file can be easily updated to account for retirements, staff turnover, and new hires, allowing continuous monitoring of departmental expertise. Beyond risk mitigation, the process supports professional development planning and fosters team engagement by aligning individual interests with departmental needs.

CONTACT

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INTRODUCTION

Healthcare systems face growing workforce challenges:

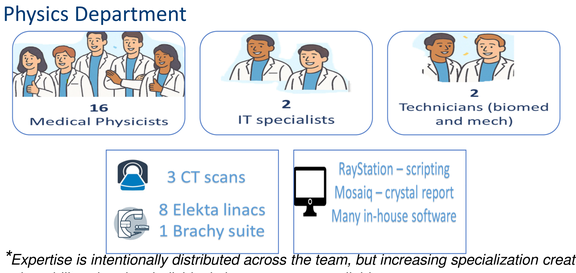
- An aging medical physics workforce
- Many upcoming retirements
- Continual increase of clinical and technological complexity

This project translates the COMP competency profile into a practical, department-level planning tool.

By identifying where expertise resides, assessing required competency coverage, and highlighting gaps, the approach supports proactive risk mitigation, strengthens resilience to staff absences and retirements, and promotes structured knowledge transfer and mentorship.

CONTEXT

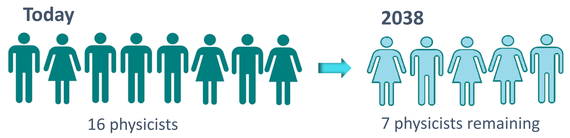
Clinical Environment and Team Composition of the Medical Physics Department



*Expertise is intentionally distributed across the team, but increasing specialization creates vulnerability when key individuals leave or are unavailable.

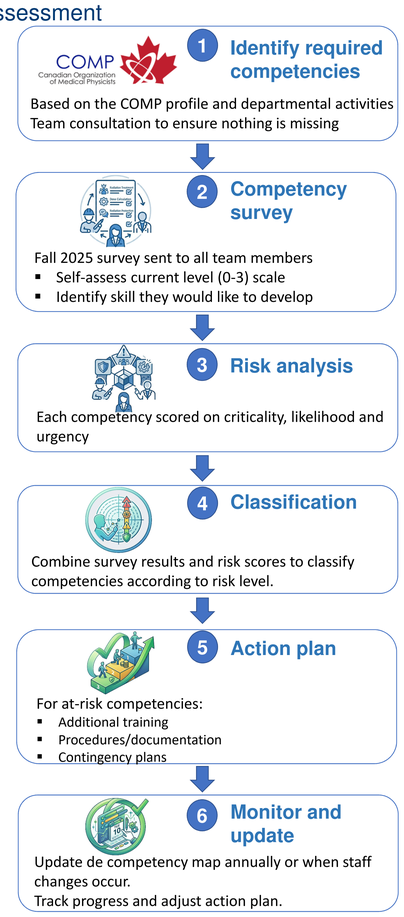
Retirements ahead

Between 2033 and 2038 we expect 8 physicists will retire



METHODOLOGY

Methodology for Competency Mapping and Workforce Risk Assessment



HOW WE ASSESS RISK

RISK ASSESSMENT METHODOLOGY

Each competency was scored on three criteria:

CRITICALITY	FREQUENCY	URGENCY
• Administrative (1) • Quality improvement (2) • Treatment-critical(3)	• Rare - Annually or less(1) • Occasional - Monthly (2) • Frequent - Daily (3)	• Can wait 1 month(1) • Can wait 1 week(2) • As soon as possible(3)

A risk score was calculated for each competency by combining the three risk criteria scores with the number of physicists qualified in that competency:

RISK SCORE = CRITICALITY + FREQUENCY + URGENCY − # PHYSICISTS

Competencies were categorized according to their risk score:

LOW RISK (< 0) OK	MODERATE RISK (0) MONITOR	HIGH RISK (> 0) AT RISK

Example of risk analysis

	EXAMPLES		
	Low Risk Competency *Ensure appropriate data is collected and applied in treatment planning algortihms*	Moderate Risk Competency *Establish the protocol for and apply best practice to in-vivo dosimetry measurements.*	High Risk Competency *Recognize and respond to emergencies involving the CRAD system*
CRITICALITY	3	3	2
FREQUENCY	1	2	2
URGENCY	1	2	3
# EXPERTS OR COMFORTABLE	6	7	3
RISK SCORE	**-1**	**0**	**4**

Table 1: Example of the risk analysis for competencies, showing the assessment of criticality (clinical/patient impact), frequency (likelihood of occurrence), and urgency (allowable delay)

RESULTS AND ANALYSIS

COMPETENCY MATRIX

0 No familiarity | 1 With assistance | 2 Comfortable | 3 Expert

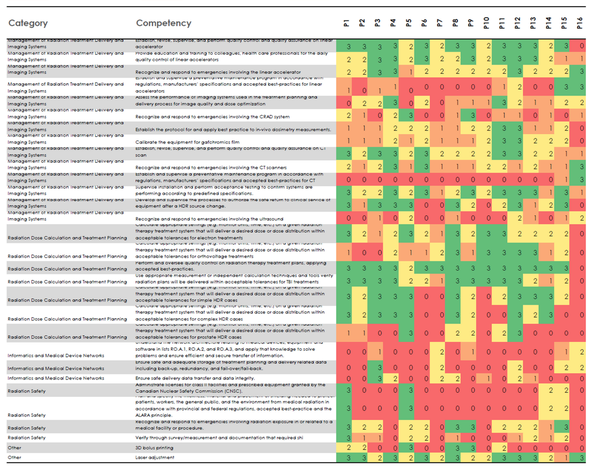


Table 2:Excerpt of heat map showing self-assessed level (0-3) of competency by physics team

COMPETENCY CLASSIFICATION OVERVIEW

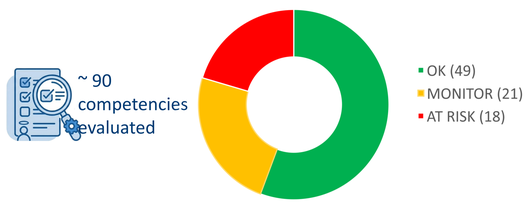


Chart 1 :Baseline distribution of departmental competencies across risk categories, based on the Fall 2025 survey, prior to implementation of mitigation actions.

ACTION PLAN

For each at-risk competency, potential strategies were evaluated to reduce vulnerability and improve workforce resilience.

MITIGATION STRATEGIES CONSIDERED

Three complementary approaches were considered:

1. Workforce Development	2. Documentation	3. Contingency Planning
Increase the number of qualified physicists for the competency	*Strengthen procedures and resources*	*Define backup solutions to ensure service continuity*
▪ Identify additional staff to be trained ▪ Develop or update training plans ▪ Provide targeted learning opportunities	▪ Review and update procedures ▪ Create or improve step-by-step guides ▪ Incorporate tips and troubleshooting	▪ Identify alternative methods or workflow ▪ Determine backup software or tools ▪ Establish access to external resources ▪ Document and test contingency plans

How the staff survey results were used:

Train staff	Review procedures	Leverage experts
Survey allowed to identify staff that was interested in developing a new competency	*Physicists who identified themselves as needing assistance with a task were asked to review procedures and documentation*	*Subject matter experts developed and tested contingency options*

RISK MITIGATION PLAN

Initial mitigation measures identified for at- risk competencies

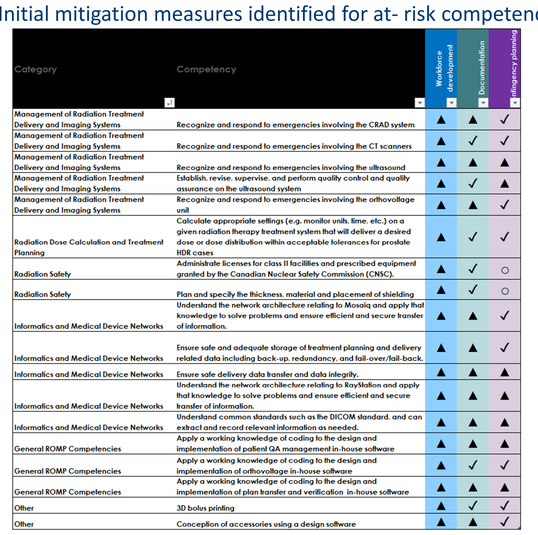
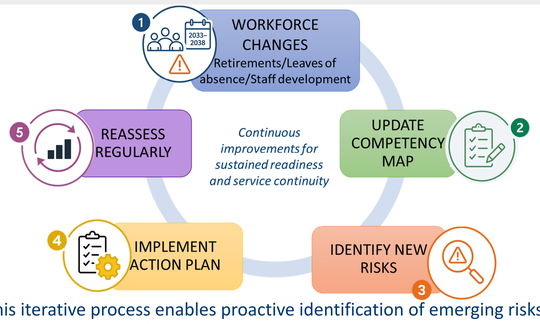


Table 1: Initial mitigation plan developed following the Fall 2025 risk assessment. Symbols indicate whether a strategy was already in place (✓), recommended for implementation (▲), or deemed not applicable or required (○) at the time of analysis.

LIVING TOOL



This iterative process enables proactive identification of emerging risks, including anticipated retirements and supports timely implementation of mitigation strategies before gaps impact patient care.

CONCLUSIONS

- COMP competency profile provided a strong foundation for workforce planning
- Competency mapping helped identify hidden risks
- Action plan supports knowledge transfer ahead of retirements
- Living tool allows for an adaptable framework for a resilient medical physics service

REFERENCES

Canadian Organization of Medical Physicists (COMP). *Medical Physics Core Competency Profile.* 2021.

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