

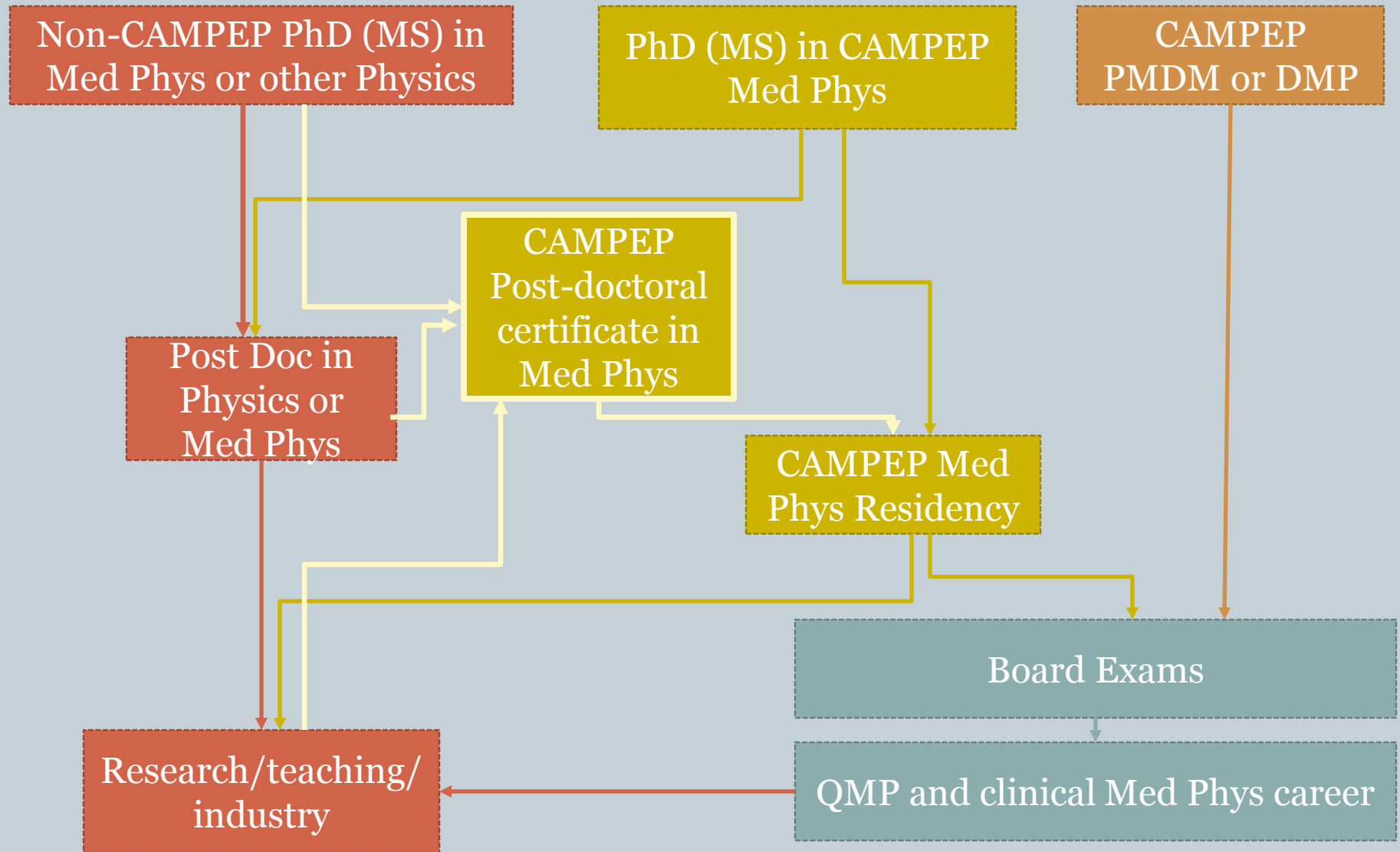
Post-Doctoral Certificates in Radiation Oncology Physics

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Graduate Training and Career Pathways in Medical Physics



Certificate Program Motivation



- Many applicants to our residency programs
- Few have the background preparation and soft skills needed to be exceptional medical physicists.
- Several applicants each year to our M.Sc. Program from people who already hold a Ph.D. in physics

Certificate Program Goals



- To prepare Ph.D. level physicists for entry into a radiation oncology physics residency program
 - Complying with AAPM Report 197s

However...
residency positions are
extremely competitive!

Certificate Program Design Considerations



- How do you prepare a Ph.D. physicist for a medical physics residency?



Credit Courses

As detailed in
AAPM Report
197S



Credit Courses



American Association of Physicists in Medicine,
Report No. 197S graduate-level core topics in 18
credit hours:

1. Radiological Physics and Dosimetry
2. Radiation Protection and Radiation Safety
3. Fundamentals of Imaging in Medicine
4. Radiobiology
5. Anatomy and Physiology
6. Radiation Therapy Physics



Credit Courses



These courses set the minimum time requirement to about 8 months.

They also form the minimum requirement for entry into a residency position.

Is doing the minimum enough? For you? For someone who's treating your mother for cancer?



Credit Courses

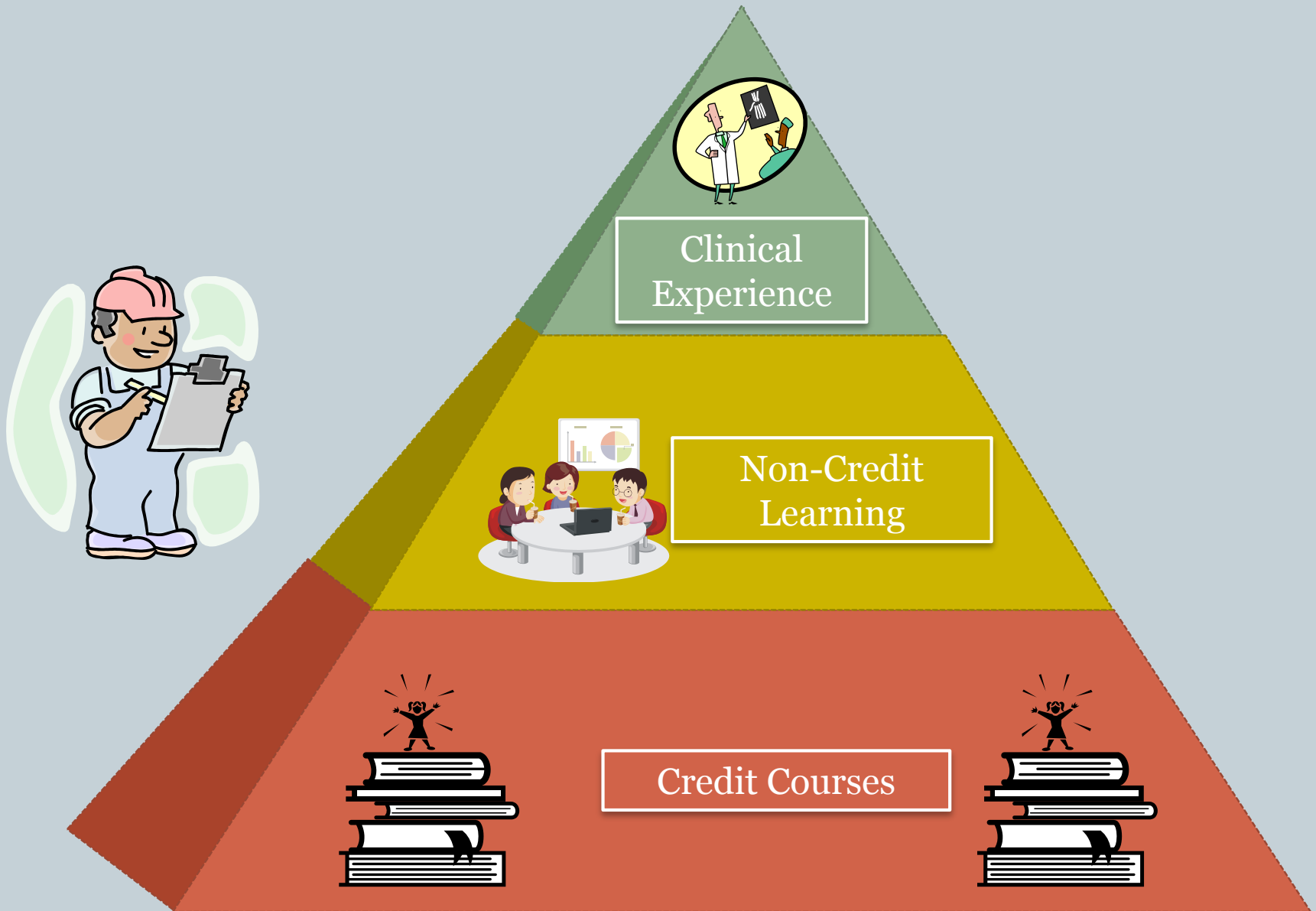


Why can't I
just do these
courses
online?

So these
courses are
necessary,
but are they
sufficient?

*What else should I be
doing to get a residency
position?*

What are residency programs looking for?





Non-credit learning



Professional Development

- Adjusting to a clinical environment
 - Demonstrate professionalism
 - Ability to prioritize
 - Handle competing projects
 - Focus on getting the job done, rather than your own needs
- Communication skills
 - Ability to interact with various professionals

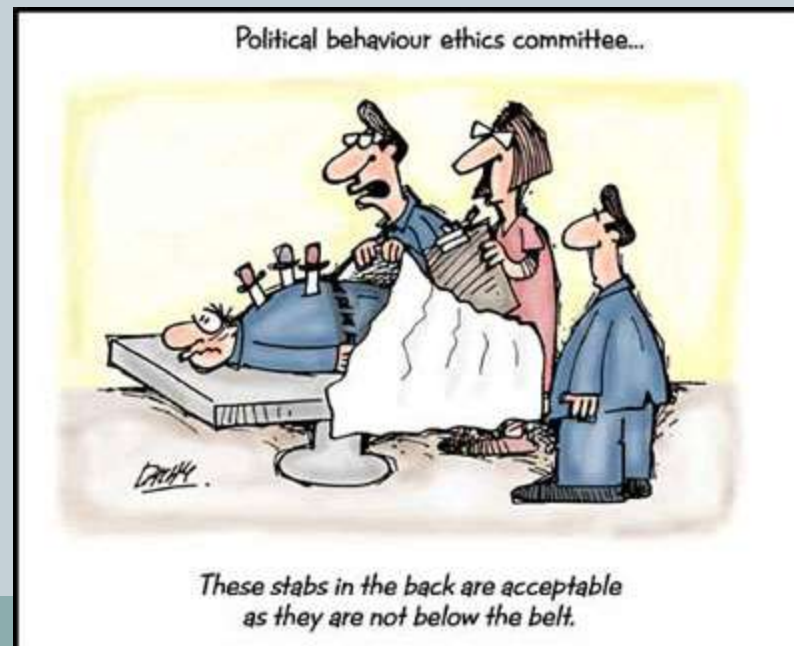
Would I want to work with you?



Non-credit learning



- Exposure to clinical and research issues
 - E.g. Ethics and Errors: a discussion-based introduction to
 - ✦ ethical analyses in clinical, professional, academic and research activities
 - ✦ analysis and management of errors in clinical radiation therapy





Non-credit learning



- Exposure to clinical and research issues
 - Reading journals
 - Attending conferences
 - Talking to medical physicists and medical physics students

Can you have a basic conversation about radiotherapy?



Non-credit learning



- Exposure to clinical and research issues
 - Journal Club
 - Radiation Oncology Rounds
 - Cancer Centre Grand Rounds





Non-credit learning



- Competency based learning

The screenshot shows the RTP Learning Centre website. The header includes the site name and a navigation menu with links to Home, LDR Prostate Brachy, Cone Beam CT, and HDR Brachy. A login form is prominently displayed on the right side, featuring fields for Username and Password, a Login button, and links for 'Create new account' and 'Lost password?'. Below the login form, there is a section titled 'Our Specialized Procedure Certification Program' which states it is comprised of four levels with new competencies developed, demonstrated, and tested at each level. A 'NAVIGATION' section on the right shows links for Home and Courses. The main content area on the left welcomes users to the Radiation Treatment Program Learning Centre and provides instructions on how to proceed, including a list of course categories: LDR Prostate Brachytherapy(2), Cone Beam CT - Under Development(0), and HDR Brachytherapy - Under Development(0). A search bar at the bottom allows users to search for courses.

www.rtp-learning-centre.ca



Non-credit learning

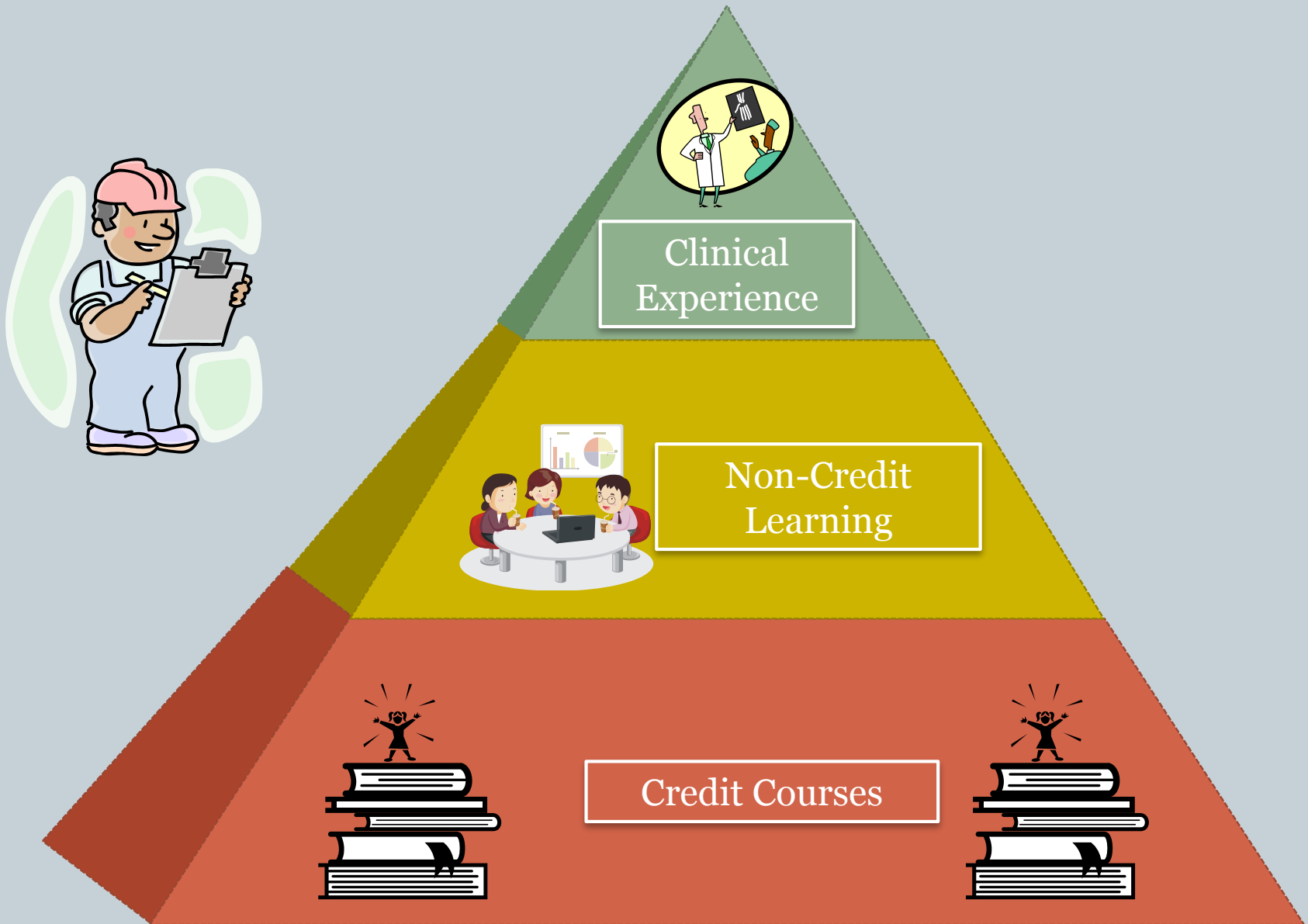


Professional Development

- Get your application noticed
 - Resume and cover letter writing
 - Interview skills

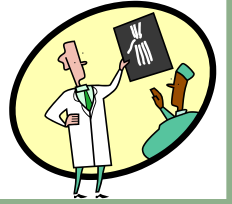


What are residency programs looking for?





Clinical experience

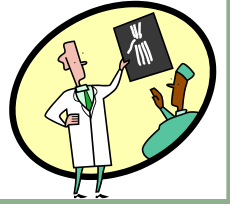


- Any clinical experience will set you apart from the other applicants:
 - Volunteer
 - Job shadow
 - Demonstrate you know what you're getting into!



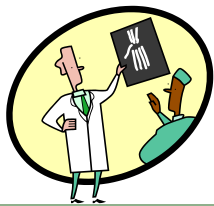


Clinical experience

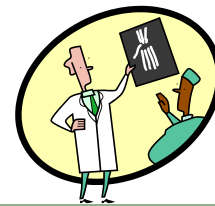


- Clinical Rotations (Minimum of 6 half-days)
 - Hands-on in cast and mould,
 - Simulator
 - 3DCRT
 - IMRT
 - SBRT
 - SRS
 - TBI
 - Brachytherapy





Clinical experience



- Basic Linac Operations and Quality Assurance
 - Weekly lecture/laboratory sessions aimed at competency in
 - ✦ performing monthly QA on linear accelerators,
 - ✦ Cobalt-60,
 - ✦ CT simulator.
 - Shadowing of Physics Assistants
 - ✦ HDR/LDR source calibration and QA
 - ✦ TBI measurements and calibration
 - ✦ Patient specific IMRT QA





Clinical experience



- Physics assistantship work (plus it pays the bills!)



TBCC Physics Clinical Program



Clinical Equipment:

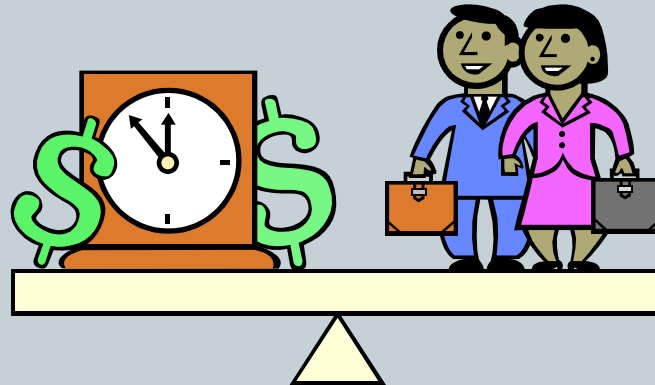
- 9 Varian linear accelerators
- 1 cobalt treatment unit
- 1 conventional and 2 CT simulators
- Eclipse treatment planning system (20 workstations)
- Prostate brachytherapy using the Nucletron seedSelectron
- HDR brachytherapy
- Stereotactic program with Novalis
- IMRT, IGRT, SBRT and participation in RTOG trials
- Total Body Irradiation
- Pediatric radiation therapy



Risk/benefits from the student perspective



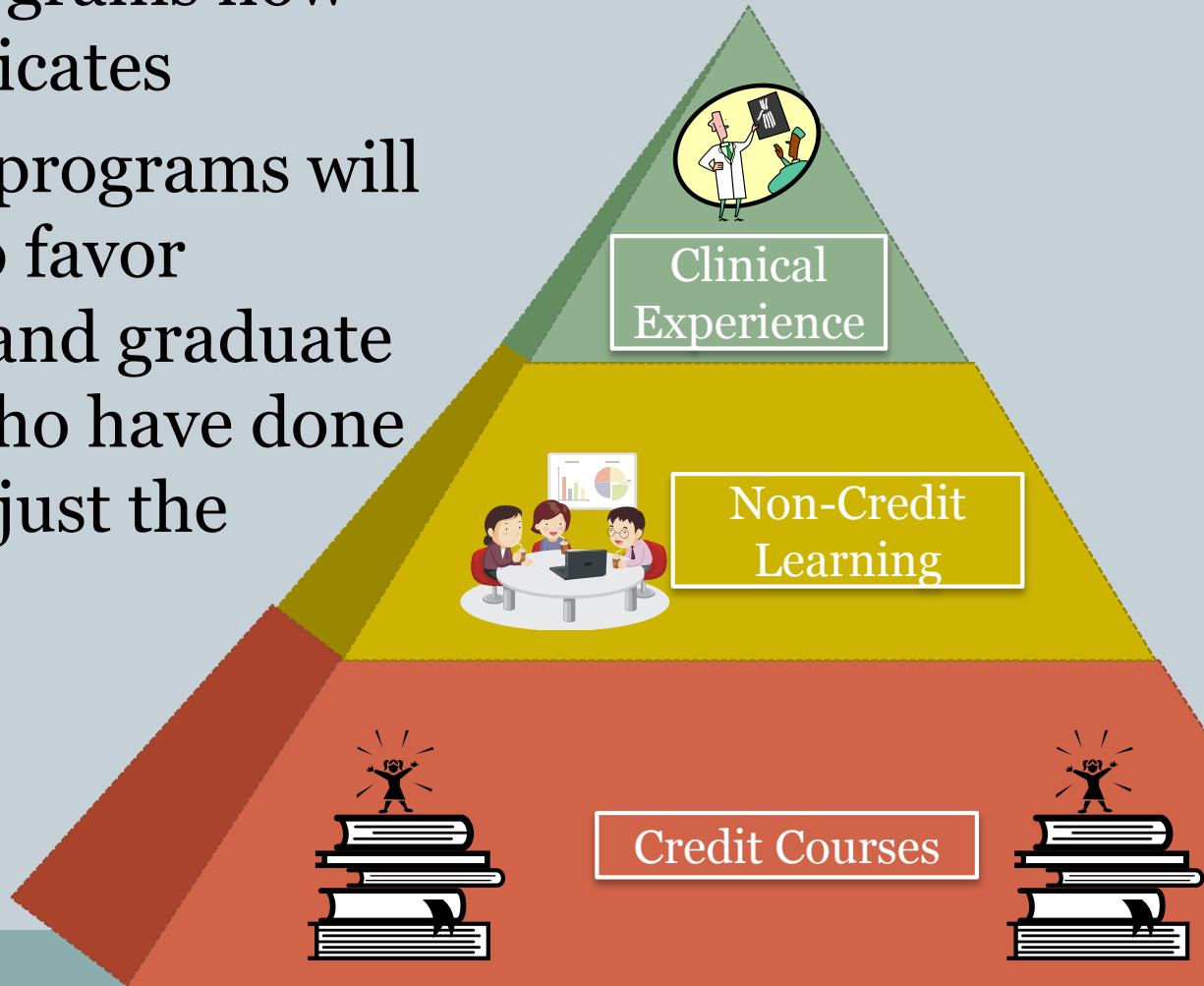
- ✗ No guarantee of a residency position
- ✗ Risk investing 8 months and lots of money
- @ Opportunity to pursue a career in Medical Physics



Conclusions



- Several programs now offer Certificates
- Residency programs will continue to favor certificate and graduate students who have done more than just the minimum.

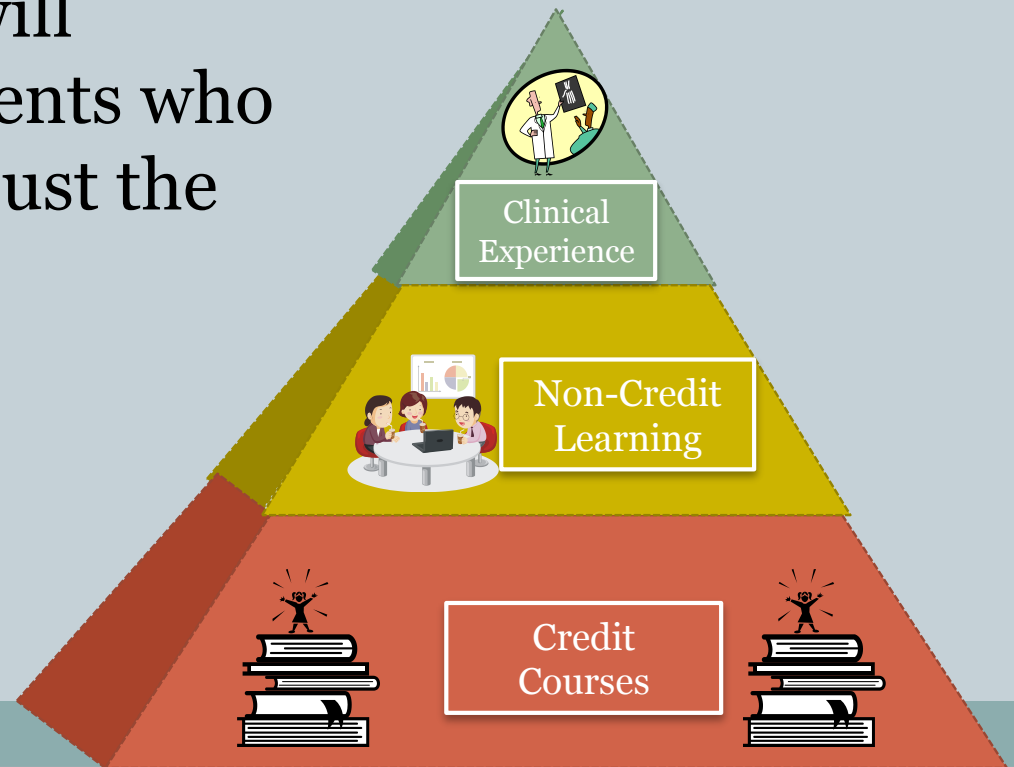






Certificate programs?

- Several programs now offer Certificates Program in Radiation Oncology Physics
- Residency programs will continue to favor students who have done more than just the minimum.





Credit Courses



Fall Semester

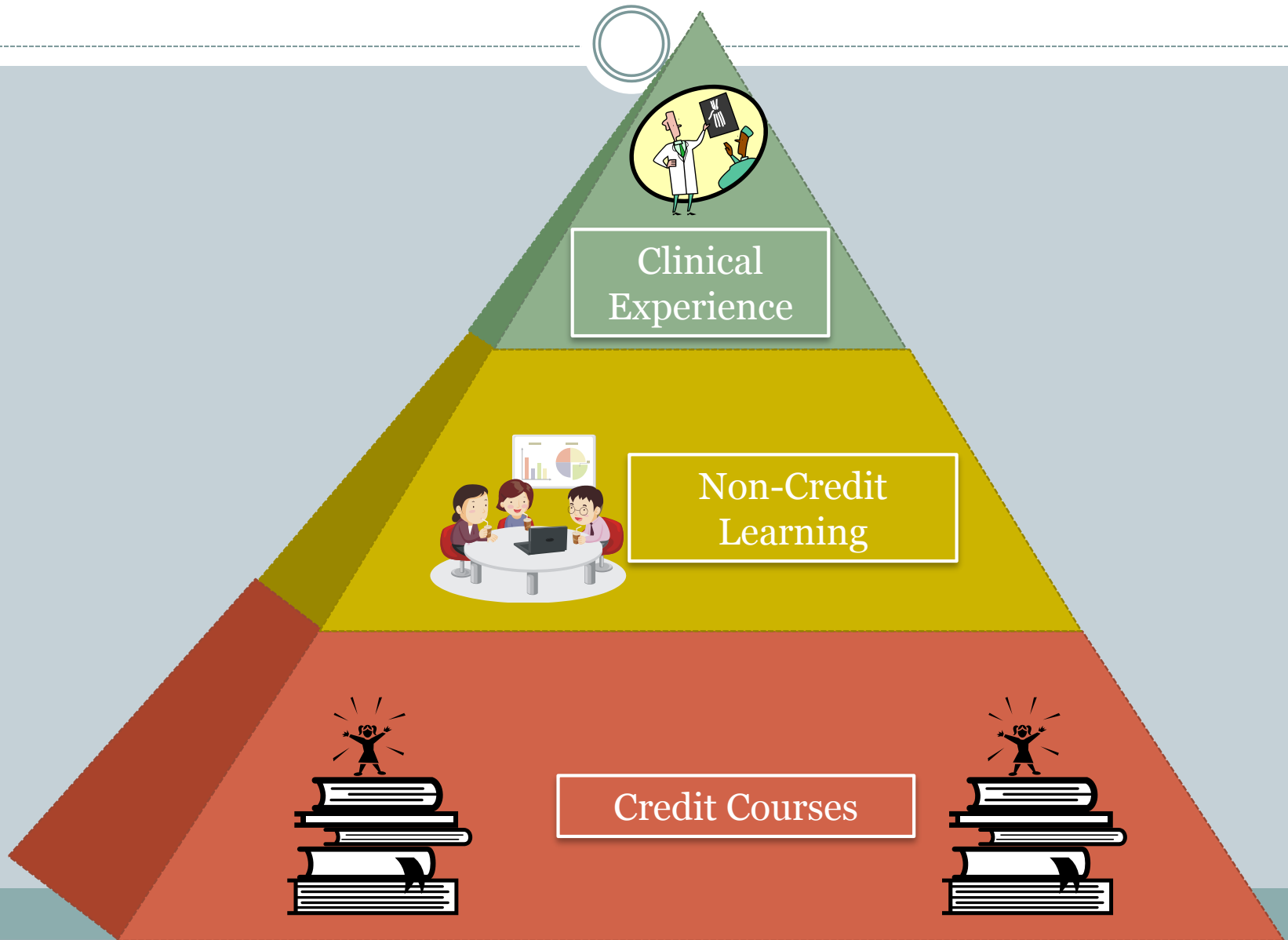
- MDPH 623 Radiological Physics and Radiation Dosimetry
 - Photon and electron interactions, charged particle and radiation equilibrium, cavity theory, absolute and relative dosimetry, calibration protocols.
- MDPH 639 Radiobiology and Radiation Safety for Medical Physicists
 - Cell kinetics, cell survival curves, radiation pathology, fractionation, radiation safety and shielding.
- MDSC 689.01 Medical Imaging Techniques
 - Introduction to the theory and practical applications of medical imaging

Winter Semester

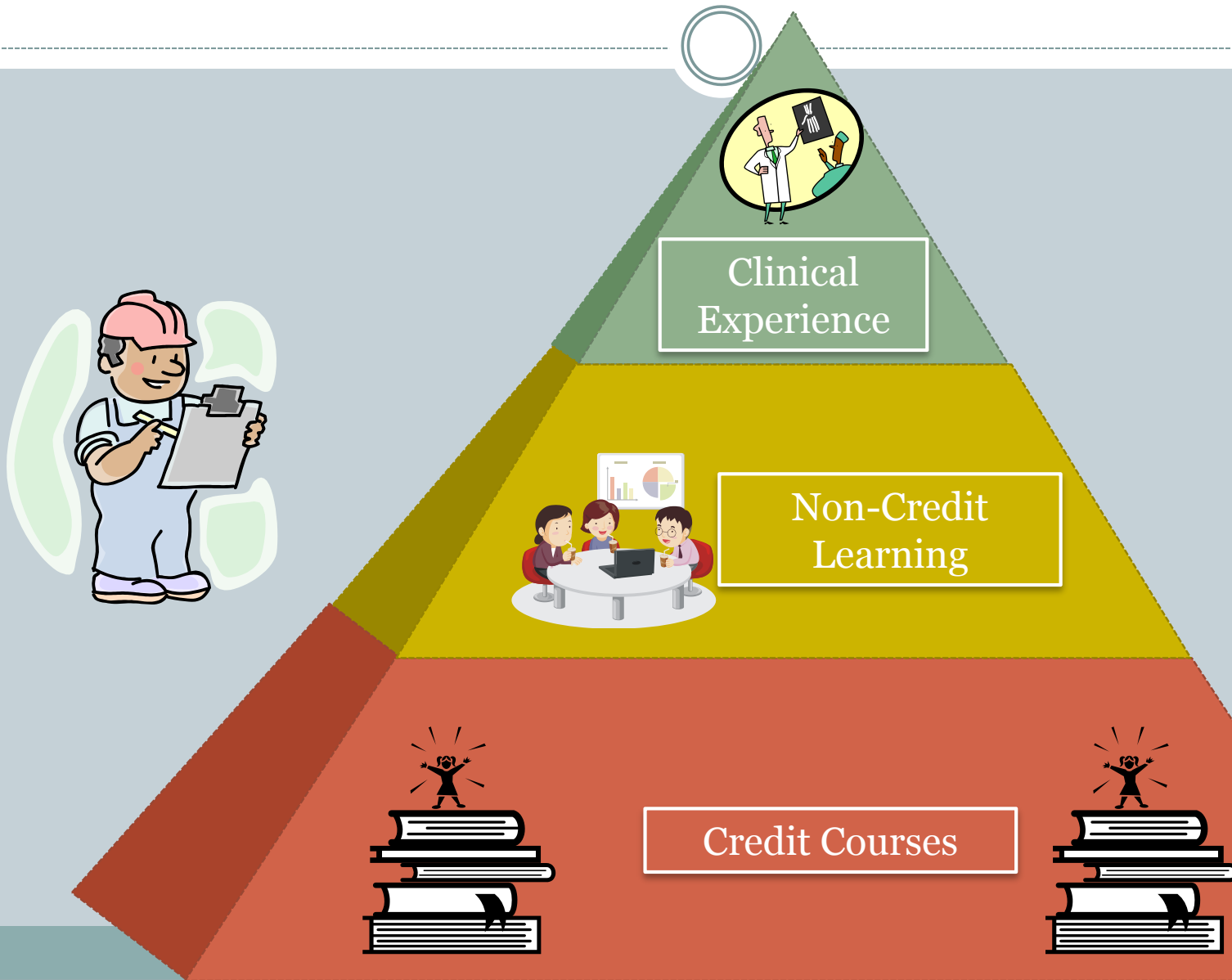
- MDPH 625 Radiation Oncology Physics
 - Clinical photon and electron beams, brachytherapy, treatment planning, radiation therapy devices, special techniques.
- MDPH 637 Anatomy and Statistics for Medical Physicists
 - Anatomy, physiology, probability, statistical inference, hypothesis testing, regression models, clinical trials, survival analysis.
- MDPH 633 Radiation Oncology Physics Laboratory
 - Absorption dose determination, dose descriptors, photon beam modelling, quality control.

*Students are eligible to receive credit for up to 1 course already completed at a graduate level.
Encompasses all didactic components identified by the American Association of Physicists in Medicine,
Report No. 197S*

What are residency programs looking for?



What are residency programs looking for?



Is it worth it? Program Costs



- Increase teaching load
- Increased number of learners per course
 - Up from 2 per course
 - May require TA for marking
 - Laboratory course workload is significantly increased
- Competition for our graduate students



Is it worth it? Program Benefits



- Enthusiasm, maturity, experience help elevate courses
- Expanded pool of residency applicants
- Provides opportunity for career changes
- Competition for our graduate students



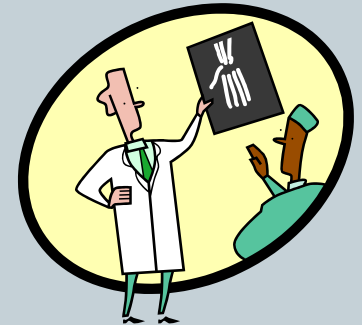
Certificate Program Design Considerations



Credit Courses



Non-Credit
Learning

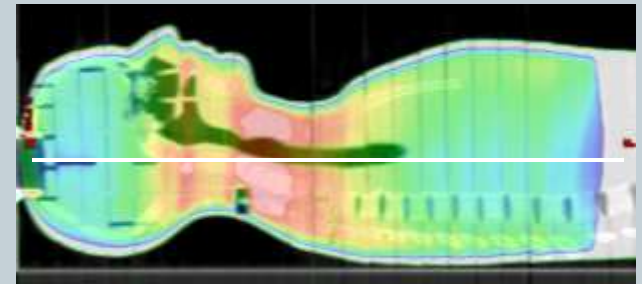


Clinical
Experience

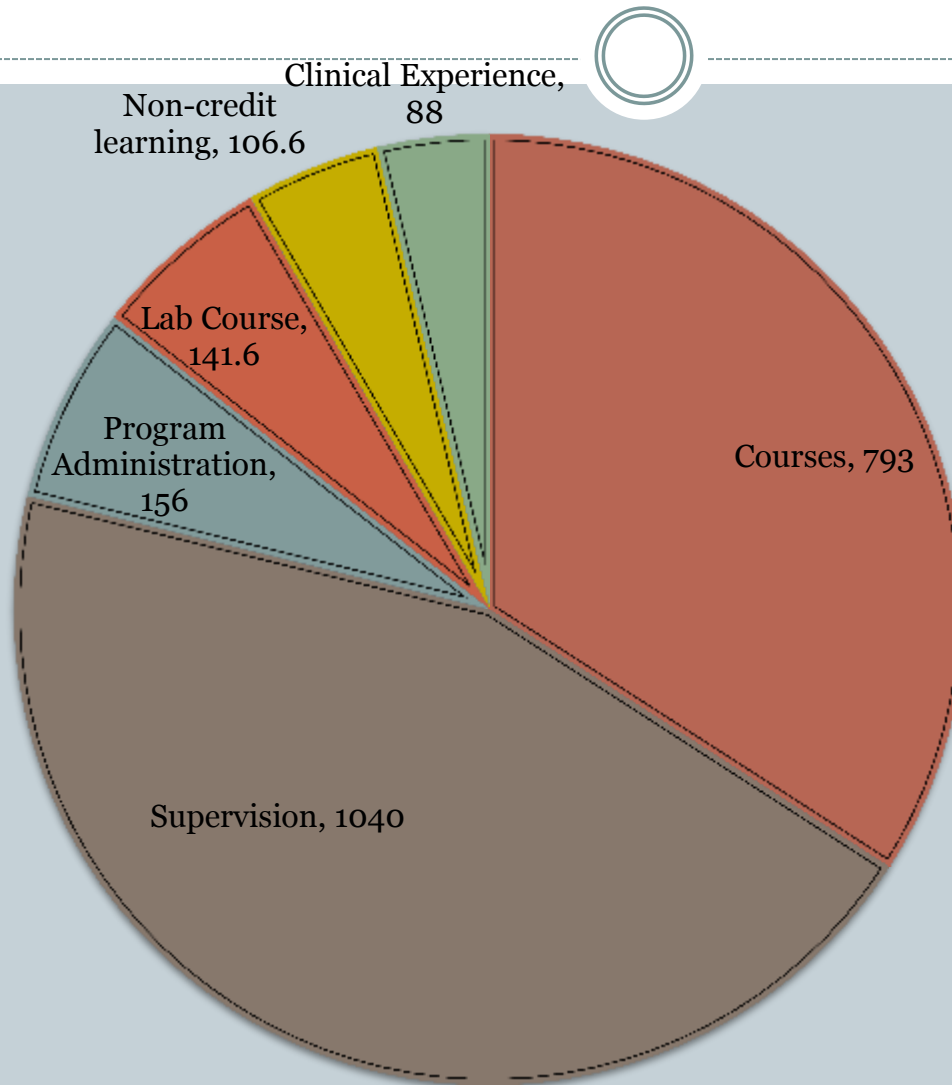
U of Calgary: Radiation Oncology Physics



- CAMPEP Graduate Program
 - Radiation Oncology Physics, a specialization within Physics and Astronomy
 - Average enrollment 8-10 total (half Ph.D.)
- CAMPEP Residency Program
 - Incorporates the University of Calgary Post-Doctoral Diploma in Radiation Oncology Physics
 - 3 current residents in a two-year program
- CAMPEP Certificate Program
- <http://www.ucalgary.ca/rop/>



Time to run a 10-student graduate program

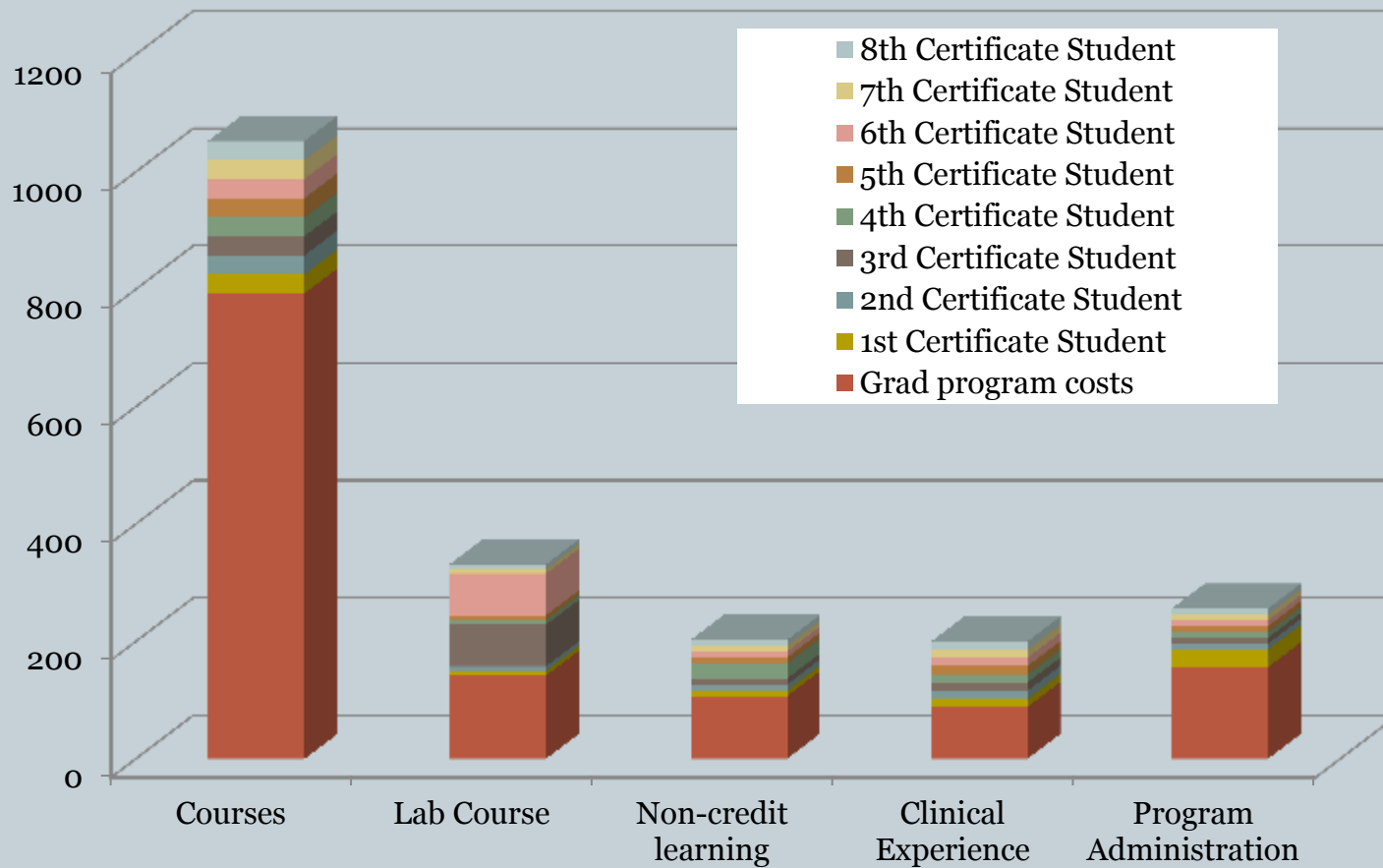


Hours per year

Non-credit learning includes:

- Ethics and Errors,
 - Journal Club,
- Clinical Experience includes
- Clinical Rotations
 - QA training

Incremental cost of certificate program



Certificate Program Budget				
Enrollment	1	2	4	8
<i>Revenue</i>				
Program Fees	\$2,000	\$4,000	\$8,000	\$16,000
Course Fees	\$4,171	\$8,342	\$16,684	\$33,368
Subtotal	\$6,171	\$12,342	\$24,684	\$49,368
<i>Expenditures</i>				
Salaries	\$0	\$7,957 (1 TA)	\$ 11,936 (1.5 TA)	\$15,915 (2 TAs)
Scholarships	\$0	\$0	\$1,500	\$8,000
Travel	\$0	\$0	\$1,000	\$4,000
Administration Expense (27%)	\$1,666	\$3,332	\$6,665	\$13,329
Subtotal	\$1,666	\$12,290	\$21,101	\$41,244
<i>Excess of Revenue over Expenses</i>	\$4,505	\$1,052	\$3,583	\$8,124

Course fees are set by FGS at \$695.16 per course for 2010-2011; we suggested a program fee of \$2000 per student. We chose to run a surplus to ease University approval of the program.

All international students get a grant in the amount of the differential between Canadian and International fees, by departmental policy.

Supplementary Information



Stop talking now, Peter.



U of Calgary: Radiation Oncology Physics



- Summer student research experience
 - Average 4-5 per summer
 - 3 Canadian, medical physics / physics undergraduates
 - 1 French summer internship in Biomedical Engineering
 - 1 machinist
- Undergraduate research project supervision
 - 1-3 per year
- Provide RO residency physics education
 - Average 7 total residents in 5 year program.

Time required to run a graduate program



- Courses are 13 weeks long, 3 h per week
 - 1st time teaching prep = 5 x lecture
 - 2nd time teaching = 1.5 x lecture time
- Laboratory
 - Primary instructor = 5 hr contact, 5 h prep x 8 labs
 - Secondary instructor = 5 hr contact, 2.5 hr prep x 8 labs
- Clinical rotation 6 hours
- Journal Club
 - 2 hr/wk * 26 weeks = 52 hours

Time required to run a graduate program



Supervision hours

- Summer Students = 2 hr per week * 13 wks = 26 hr
- 599 Students = 2 hr per week * 13 wks = 26 hr
- 598 Students = 2 hr per week * 26 weeks = 52 hr
- MSc Students = 2 hrs per week * 52 weeks per year = 104 hr per year
- PhD Students = 2 hrs per week * 52 weeks per year = 104 hr per year
- Graduate committee members 5 hrs/ year
- Resident project supervision = 26 hr

Distance learning



- Loss of clinical opportunities
- Increased convenience for students
- Little direct benefit to our centre with our budget model

TBCC Clinical Physics Program



The Tom Baker Cancer Centre is a fully equipped, tertiary cancer treatment facility, delivering ~3000 RT courses/yr

Clinical Staff

- 11 Qualified Medical Physicists
- 18 Radiation Oncologists
- 4 Radiation Therapy Equipment Service Specialists.
- 2 Instrument makers
- 20 FTE Radiation Therapists in immobilization, treatment planning and simulation
- 45 FTE Radiation Therapists in treatment delivery

