Getting Ready for a Clinical Physics Career: Is this the right choice for you?

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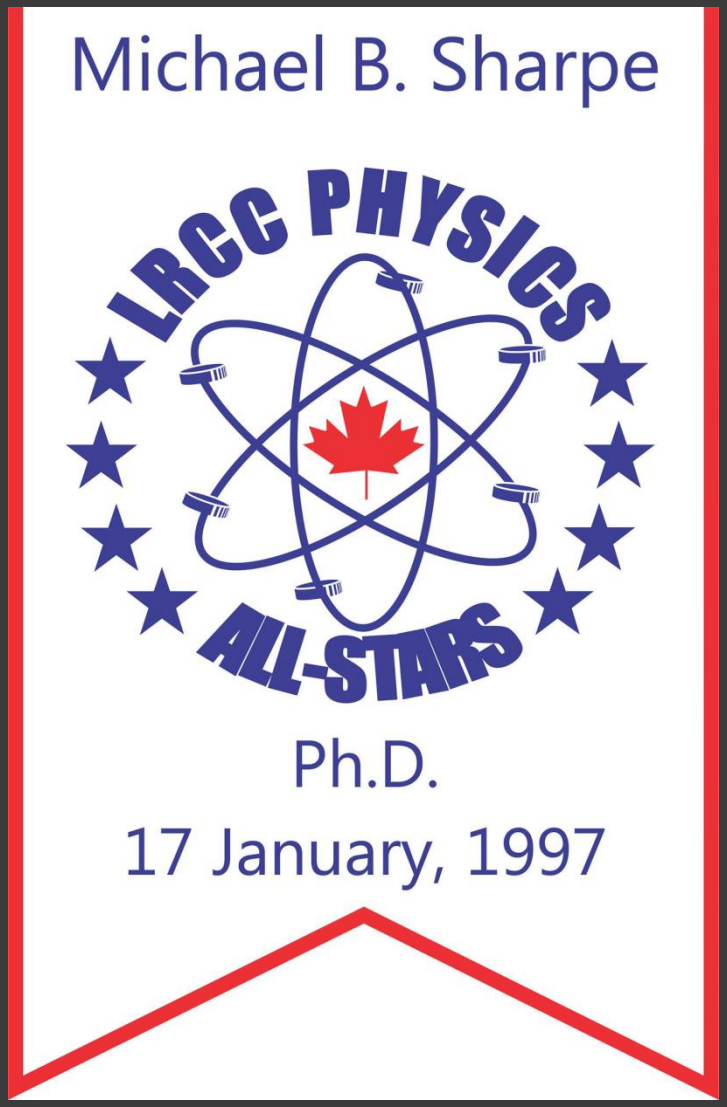
Director, Physics Research & Education
London Regional Cancer Program

London, Canada

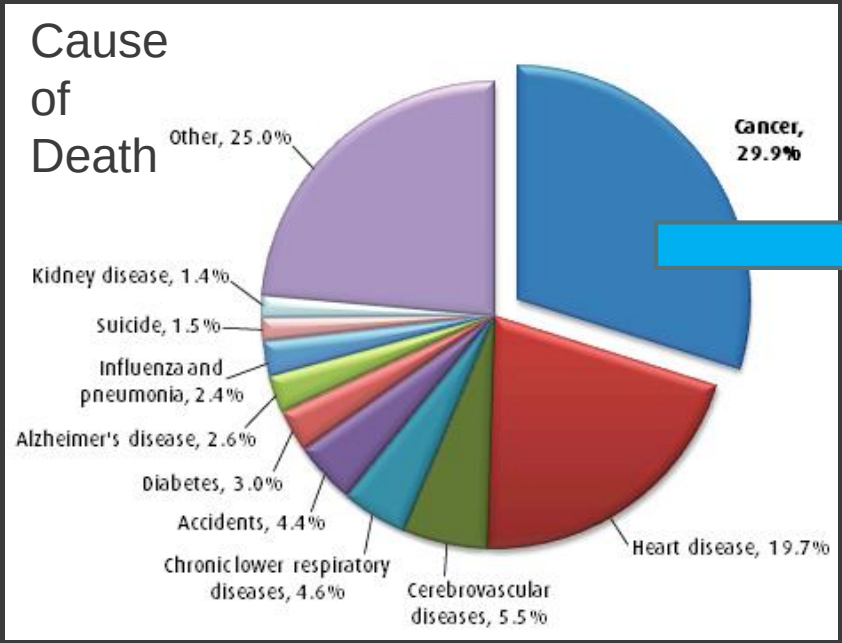
Colourful
INTERACTIONS
Colorées

This Lecture is dedicated to Michael



- Why a career in clinical physics?
- Education Pathway(s)
  - CAMPEP-o-mania
- Residency Positions (Ontario)
  - Interview Preparation
- Workforce Projections
- Biology-Physics Synergy?

It helps patients! Diagnosis & Therapy

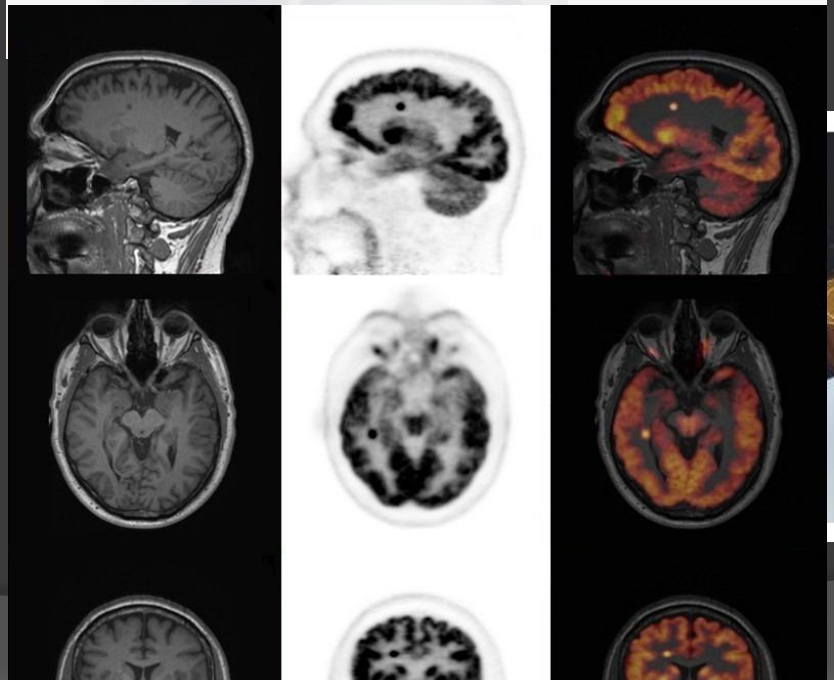


Government of Canada | Gouvernement du Canada

Canadian Cancer Society | Société canadienne du cancer

Produced by Canadian Cancer Society, Statistics Canada, Public Health Agency of Canada, Provincial/Territorial Cancer Registries
cancer.ca/statistics

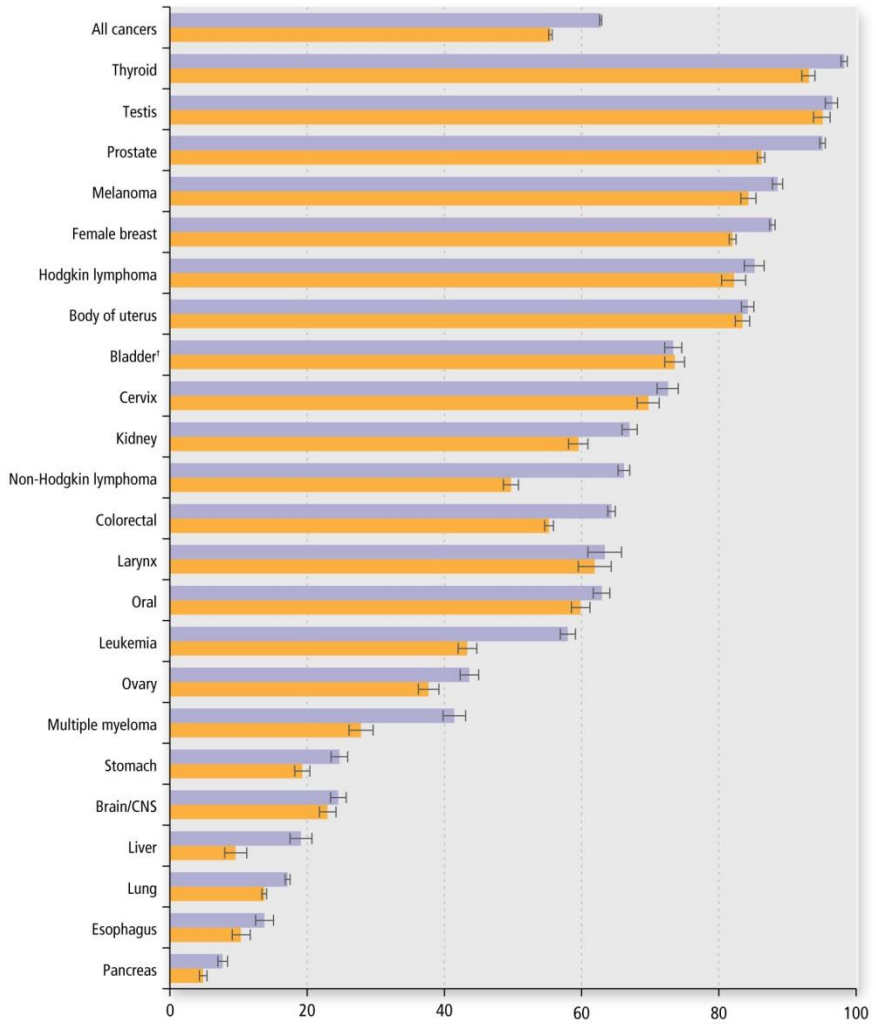
It’s Exciting ! Convergence of Imaging-Therapy



Has Clinical Impact!

Radiation Oncology affects 40-50% of patients

FIGURE 5.2 Age-standardized five-year relative survival ratio (RSR) for selected cancers, Canada (excluding Quebec*), 2006–2008 versus 1992–1994



CNS=central nervous system

* Data from Quebec were excluded, in part, because the method for ascertaining the date of cancer diagnosis differs from the method used by other provinces/territories and because of issues in correctly ascertaining the vital status of cases.

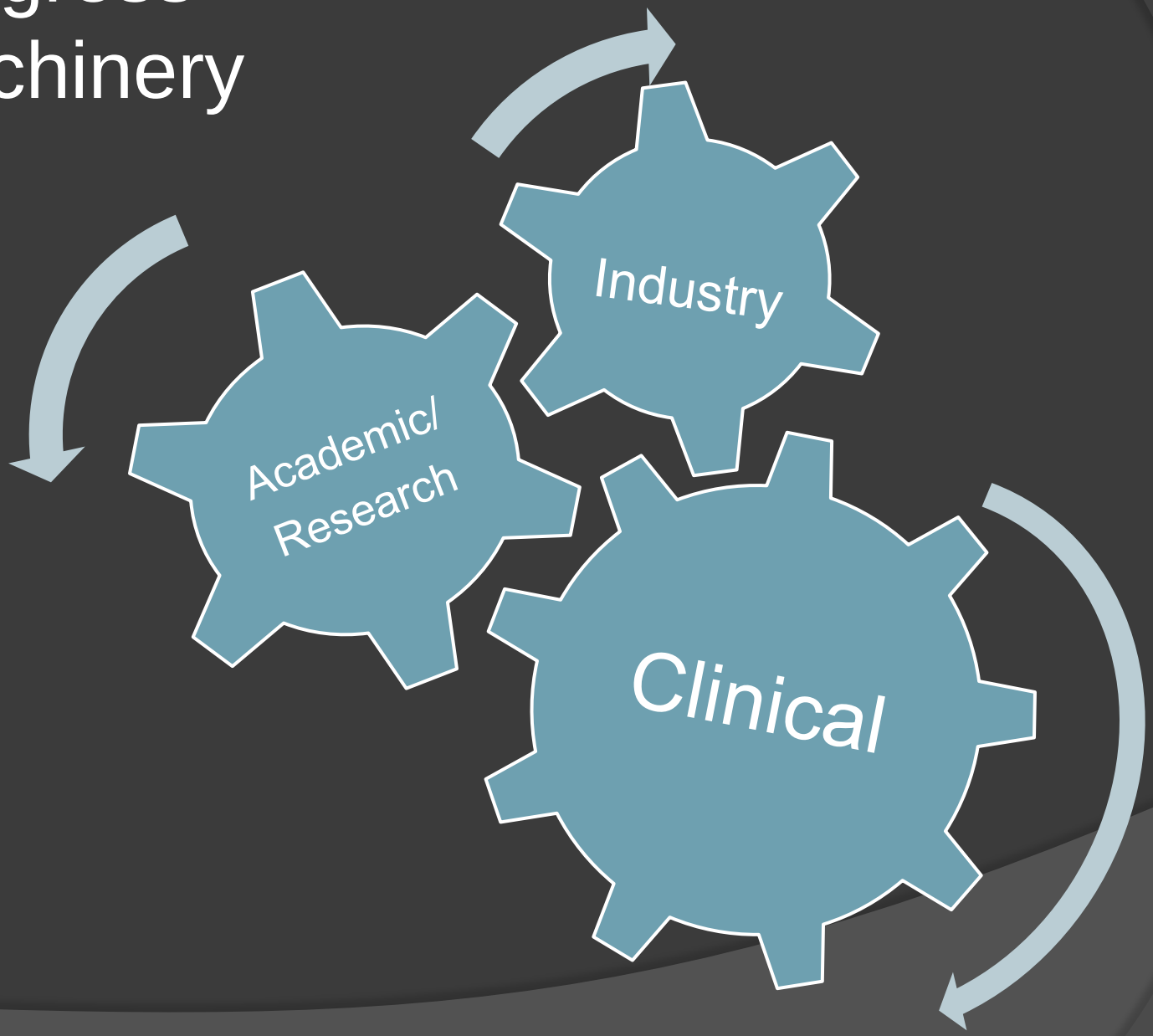
† Excludes data from Ontario, which does not currently report *in situ* bladder cancers.

Note: These data are based on people aged 15–99 years at diagnosis. "All cancers" excludes adolescent (15–19 years) bone cancers, which are dissimilar to those diagnosed in older adults, and non-melanoma skin cancers (neoplasms, NOS; epithelial neoplasms, NOS; and basal and squamous). Error bars refer to 95% confidence intervals.

Analysis by: Health Statistics Division, Statistics Canada
Data sources: Canadian Cancer Registry database and life tables at Statistics Canada

Canadian Cancer Statistics 2014

Progress Machinery



	University/ Research Institute	Industry	Clinical
Research Activity	"R&D" Curiosity-Driven	"R&D" Commercially-driven	"R&D" Clinically-driven
Clinical Role	Limited or Split	New Products Technical Support	Clinical Procedures Clinical Trials
Translational Research	Longer Term	Intermediate Term	Short Term
Teaching	Courses/Labs Instructor Graduate students Residents Fellows	Training Courses Staff Customers	Courses (partial) Graduate students Residents Hospital Staff
Stressors	Grants -"Publish or Perish" Lectures - prep Student mentoring	Product Releases Trade Shows Customers	Clinical Deadlines On-Call Duties
Job Demand Job Security	Fair Very Good (Tenure Track)	Good Variable	Good (Oncology) Very Good
Travel	Very Good (with grants)	Excellent	Good (Regulated)
Internationalism	Encouraged	On-Demand	*Physicists without Borders*
Salary & Benefits	Very Good	Wide Range	Excellent (Oncology)

It Pays Well!

Salary, Benefits, Vacation, Allowances, Flexibility

PhDs certified
20/80
Percentiles
$121– $183k /yr

TYPICAL SALARY RANGES FOR AAPM MEMBERS WORKING IN CANADA

Salaries are in thousands of Canadian dollars

			Primary Income				Total Income			
				Percentiles				Percentiles		
	Number	Median Yrs Exper	Average	20th	Median	80th	Average	20th	Median	80th
Overall	150	14	139.3	105.0	141.3	168.0	141.7	107.1	143.3	174.2
Masters no cert.	5	17	101.7				101.7			
Masters with cert.	40	20	138.7	105.1	139.8	173.6	143.6	106.1	149.0	178.0
PhDs no cert.	28	6	111.3	83.2	112.4	132.8	112.6	83.2	113.8	132.8
PhDs with cert.	76	13	153.0	121.2	153.1	183.0	154.5	121.2	154.5	185.0
PhD -With Certification (all data below)										
Gender										
Male	57	15	156.8	128.0	156.0	186.6	158.7	128.0	156.0	188.2
Female	19	10	141.4	106.0	150.0	162.6	142.0	106.0	150.0	162.6
Type of Position										
Primarily Clinical	61	11	147.2	120.0	150.0	168.0	148.7	120.0	152.0	170.0
Primarily Academic	7	30	172.7				173.4			
Primarily Administrative	6	20	179.1				179.1			
Certification										
ABR-Therap. Rad. Physics	8	14	158.8				161.3			
CCPM	72	13	152.0	121.8	153.1	177.9	153.3	121.8	154.5	182.0
Primary Employment										
Government Hospital	36	14	148.8	121.2	154.5	171.9	149.9	121.2	154.5	171.9
Med School or Univ Hospital	15	20	168.5	117.5	170.0	207.6	172.4	119.8	175.0	207.6
Cancer Center	17	10	144.9	118.8	143.0	170.4	144.9	118.8	143.0	170.4
Primary Discipline										
Radiation Oncology	62	14	156.1	128.0	155.0	185.6	157.5	128.0	155.5	186.6
Years Experience										
0 - 2	*	*	*	*	*	*	*	*	*	*
3 - 4	6	4	110.6				113.4			
5 - 9	18	7	130.9	110.6	137.5	147.2	134.2	111.0	137.5	148.2
10 - 14	15	12	151.6	142.2	152.2	163.4	152.1	143.2	152.2	163.4
15 - 19	11	15	169.0				171.5			
20 - 24	15	22	174.7	156.7	171.0	197.7	174.7	156.7	171.0	197.7
25 - 29	*	*	*	*	*	*	*	*	*	*
30 +	7	30	181.1				181.8			

- Why a career in clinical physics?
- Education Pathway(s)
  - CAMPEP-o-mania
- Residency Positions (Ontario)
  - Interview Preparation
- Workforce Projections (Canada)
- Biology-Physics Synergy?

Pathways

B.Sc. Physics/Biophysics/Engineering

M.Sc. Physics/Biophysics/Engineering

Ph.D. Physics or Medical Biophysics

CAMPEP (Oncology)

Clinical Residency

Post Doctoral Fellow

Clinical Physicist

Certified Clinical Physicist

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Staffing Crisis of 1990's

Dr. Charles Hollenberg
President, Cancer Care Ontario

MEDICAL PRACTICE • PRATIQUE MÉDICALE

STAFFING SHORTFALL PLAGUES RADIATION ONCOLOGY

Susan Thorne

Cancer overhaul vital, doctors warn

Bad planning called key reason for huge backlog in treatment

By Lisa Priest
TORONTO STAR

Plagued by huge waiting lists, Ontario's cancer radiation centres desperately need an

doctors what services are available so they can make timely decisions for their cancer patients.

Ontario Health Minister Ruth Grier says she is committed to solving the waiting list problem, and believes reallocating hospital resources is one way of doing it.

"I'd like to get together with them (hospitals) and talk about

'It scares the hell out of you to wait' for care

Continued from page A1

MONTREAL The Gazette SINCE 1778

B6 THE GAZETTE, MONTREAL, SATURDAY, OCTOBER 3, 1998

COMMENT

Quebecers deserve better

Health-care budget cuts have led to heavy staff workloads at radiation-therapy centres

ERVIN B. PODGORSAK

Once world-class and now steadily declining toward mediocrity, Quebec's health-care system has been much in the news lately. And with good reason. Quebecers are final-

drew attention to much higher staff workloads in Quebec than the rest of Canada. It would be hard to suggest that there is any fat to cut there.

Radiation therapy is one of three medical specialties used in cancer therapy and as such is obviously very

cial health-care budgets, and are generally shielded from cuts that are applied to over-all hospital budgets.

In Quebec, on the other hand, there are seven radiotherapy centres, which operate as radiotherapy departments of major general hospitals. As such,

(30 of 149); 23 per cent of radiotherapy technologists (197 of 855); and 16 per cent of radiation dosimetrists (20 of 123).

Radiation oncologists in the rest of Canada treat, on average, 244 cancer patients annually, while Quebec radia-

Quebec radiotherapy centres, the Bouchar
ameliora
bec servi
averages.
tant area
tion.

Managing radiation therapy queues

P. Dickof FCCPM, A. Firth FRCR, C. Foord RT(T), and V. Lusk CA

Ontario Residency Program

https://www.cancercare.on.ca/cms/one.aspx?pageId=9352

- GOAL: **Steady supply of Medical Physicists to Ontario**
  - Reduce reliance on external recruitment
  - Focused on Radiation Oncology
- Standardized clinical training
  - Ontario-wide and CAMPEP compliance (in progress)
- ~20 positions (2 year program)
- 10 openings/yr

cancer care ontario | action cancer ontario

Ministry of Health and Long-Term Care

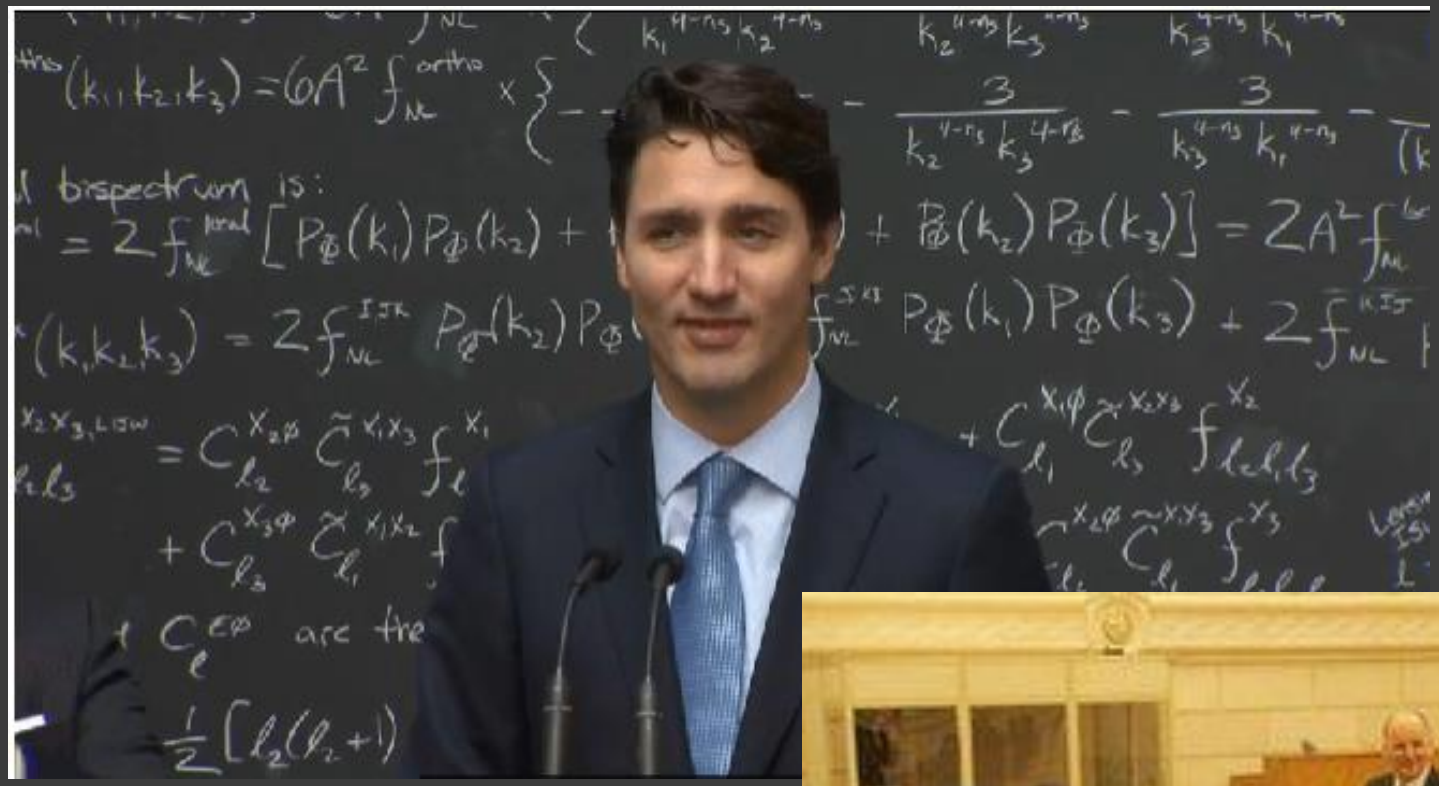
Paramount Pictures

- Typical Format
  - Normally lasts ½ to 1 full day
  - Includes a facility/people tour
  - Presentation is normally invited (PhD Project)
  - Interview Panel (4 or 5)

J^2B's Interview Tips

- Sleep well the night before
- Stay hydrated ! Limit coffee intake
- Why us? Know "Specialty of the House"
- Why you?
  - Highlight your CV briefly
- Why Clinical Physics?
  - Avoid family experience with cancer
  - Know the career path and evolution
- Answer questions directly and concisely
  - Review CAMPEP core topics: Radiation Physics/Biology
  - If question is vague/muffled/convoluted – ask for clarity
  - No clue? – Say so and guesstimate cautiously
  - Stand up and use Graphics/Whiteboard

Preparing for an Interview



- Why a career in clinical physics?
- Education Pathway(s)
  - Radiation Oncology – only
  - CAMPEP-o-mania
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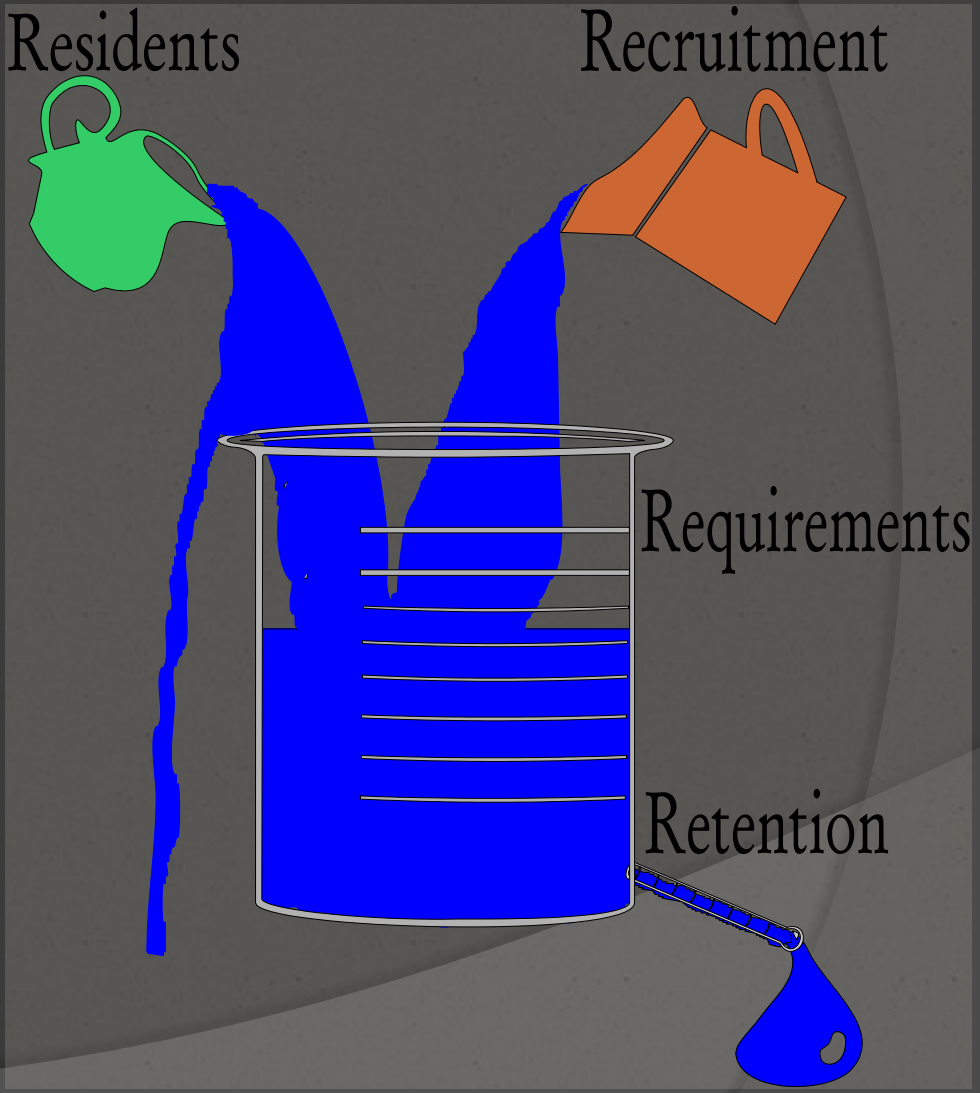
Staffing Model using “4R’s”

- **R**equirements
  - 3-5 % growth/yr
- **R**etention
  - Retirements pending
- **R**ecruitment
  - competitive
- **R**esidency Programs



JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 13, NUMBER 1, 2012

Medical physics staffing for radiation oncology: a decade of experience in Ontario, Canada

Jerry J. Battista,[1] Brenda G. Clark,[2a] Michael S. Patterson,[3]
Luc Beaulieu,[4] Michael B. Sharpe,[5] L. John Schreiner,[6]
Miller S. MacPherson,[5] Jacob Van Dyk[1]
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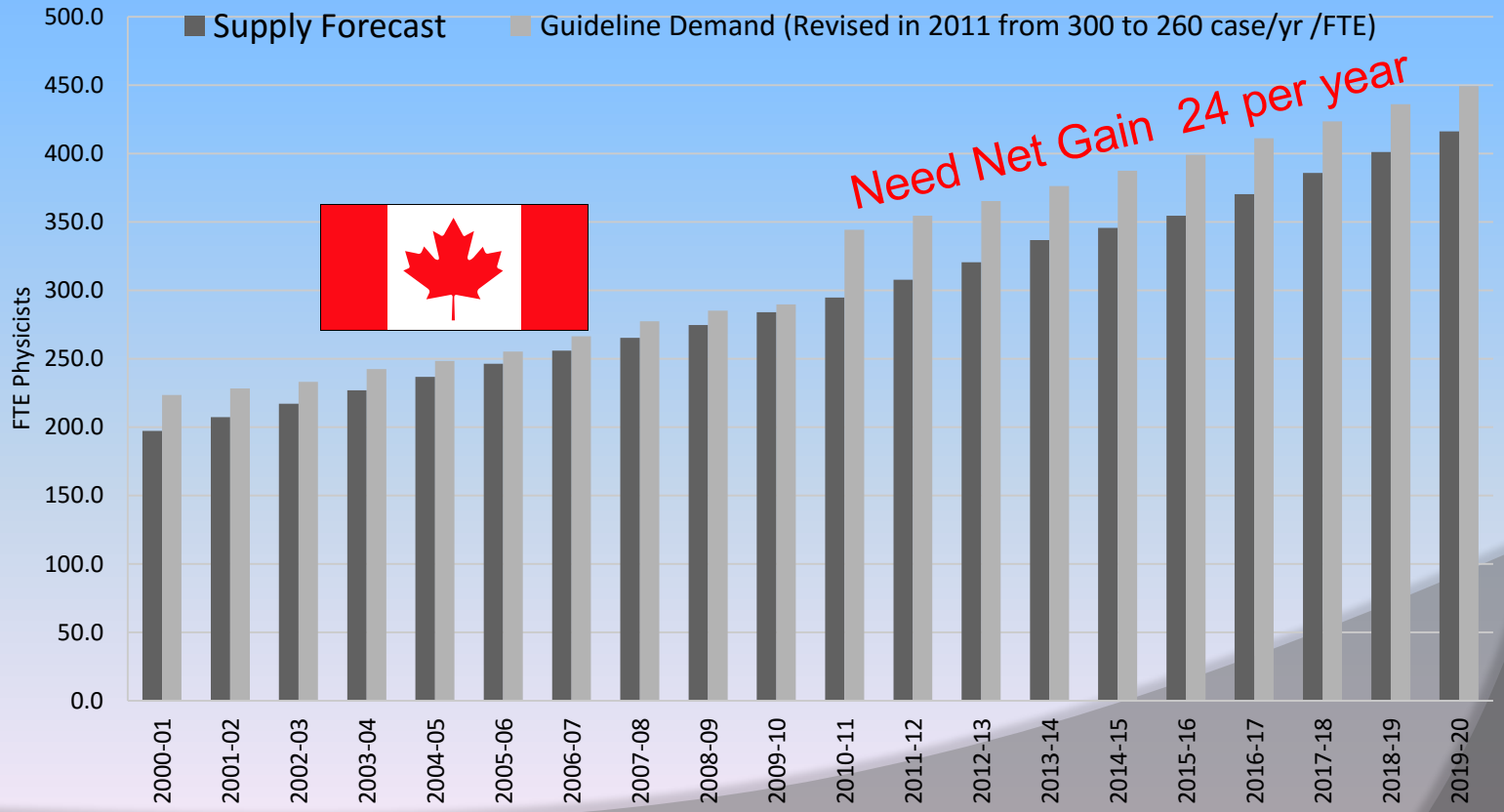
Received 13 July, 2011; accepted 26 September, 2011



USA Situation

JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 11, NUMBER 2, SPRING 2010

Future trends in the supply and demand for radiation oncology physicists

Michael D. Mills,[1a] Judah Thornewill,[2] Robert J. Esterhay[2]
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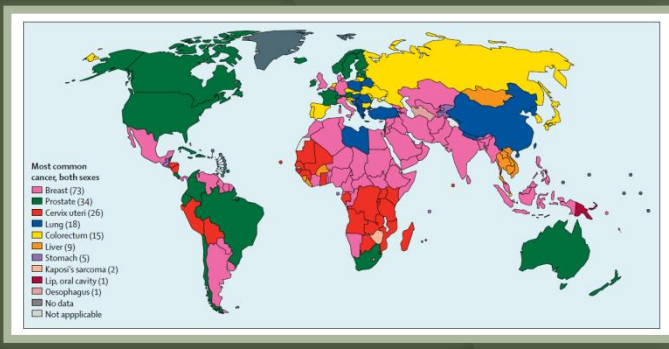
Received 16 January, 2008; accepted 18 December, 2009

"….the minimum number of new radiation oncology physicists required for the health of the profession is estimated to be 125 per year in 2020."

What about World Demand?

Cancer knows no borders



Global Medical Physics Efforts: Closing the Gap

*Jacob (Jake) Van Dyk**
Western University

Purpose: There is an increasing awareness of the disparity in Medical Physics needs between high income countries (HICs) and low-to-middle income countries (LMICs). This is especially evident with the growing incidence of cancer in LMICs. Projections from the recent Lancet Oncology Commission on Expanding Global Access to Radiotherapy indicate that an additional 22,000 Medical Physicists will be required by 2035 to provide uniform access to radiation therapy globally. This paper addresses possibilities and challenges associated with closing the Medical Physics gap between HICs and LMICs.

Methods: Medical Physics and Oncology related organizations involved in providing support to enhance cancer therapy in LMICs were reviewed, especially as related to education, training and human resource development.

Results: More than 35 organizations involved in addressing the cancer crisis in LMICs were found. Of these, 16 involve Medical Physics activities, with 7 being specific Medical Physics-related organizations. Ten of the 16 are involved in some LMIC activities with 6 having a major emphasis on LMIC contexts.

Conclusions: The development of Medical Physics human resource capacity is a major challenge for LMICs. Fifty-five countries have no radiation therapy capabilities and by implication no capacity to train Medical Physicists. Overt attention with structured and altruistic actions by HIC contexts will help make inroads into the LMIC needs. Clear options throughout career structures in support of global health considerations combined with strong partnerships between interested parties in HICs and LMICs will enhance the development of safe and resource-appropriate strategies for advancing Medical Physics capabilities.

+ 22,000 Medical Physicists by 2035

http://www.thechatterboxx.com/wp-content/uploads/2015/02/elephant.jpeg

What if …

Seniors won't retire?

Cancer rates drop?
(cancer prevention)

Major Breakthrough?
(cancer cure)

Don Cherry back for more Coach's Corner next season on new multi-year deal

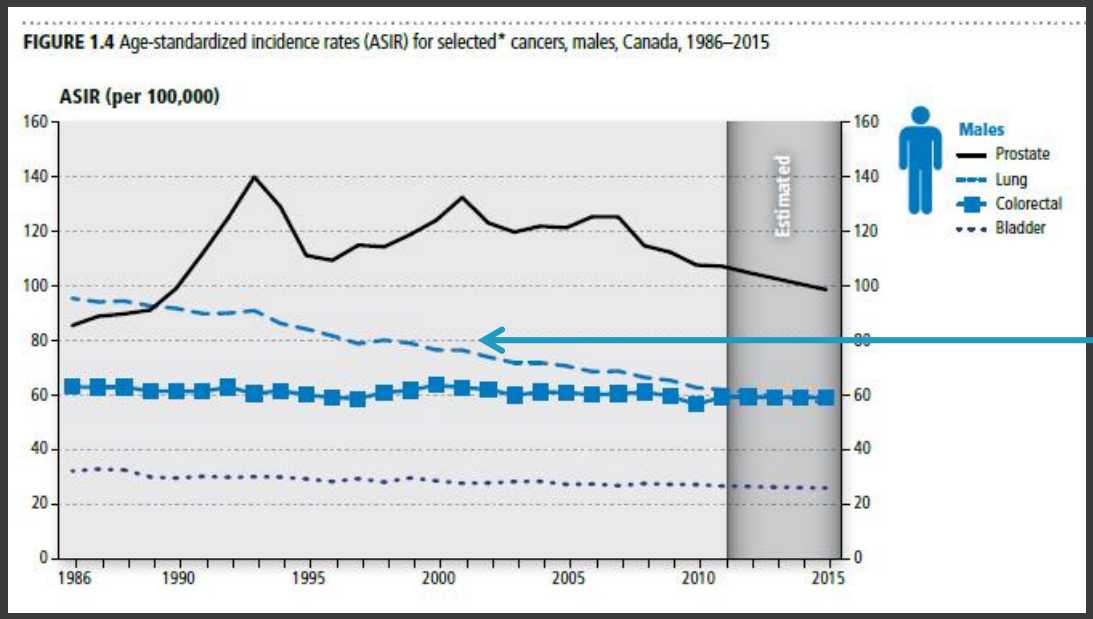
By: Jared Clinton on June 7, 2016
Filed under: NHL

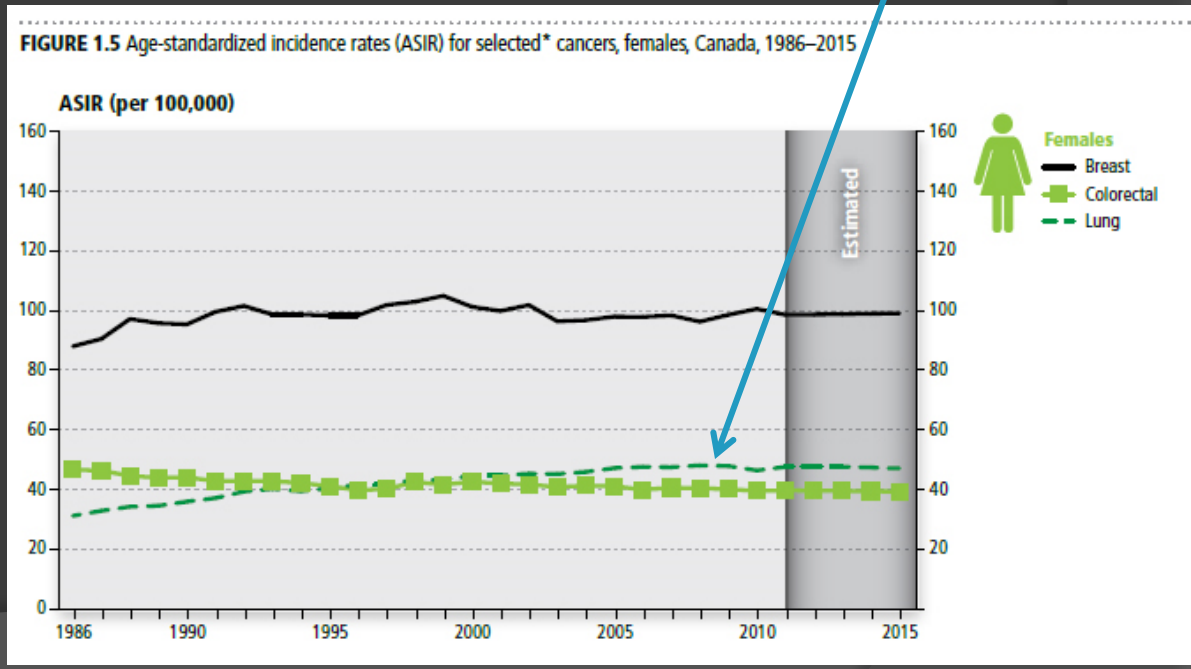
Don Cherry (Adam d'Oliveira photography)

LATEST BLOG POSTS:

- Sharks need to replicate NHL's greatest comeback ever to capture Stanley Cup
- ECHL fans, rejoice! Minor league is coming to EA Sports' NHL 17
- Ranking the three horses left in the Conn Smythe race
- Pittsburgh's defense has killed our pre-final assumptions
- Lucic's agent says no recent talks with Kings as winger prepares for free agency
- 'It's hard hockey': It's hard to watch, too, when stars are snuffed out
- Don Cherry back for more Coach's Corner next season on new multi-year deal
- Metallica did an awesome rendition of the national anthem in San Jose
- Penguins' Ian Cole p… a good time to score his first career …ff goal

Lung Cancer Prevention

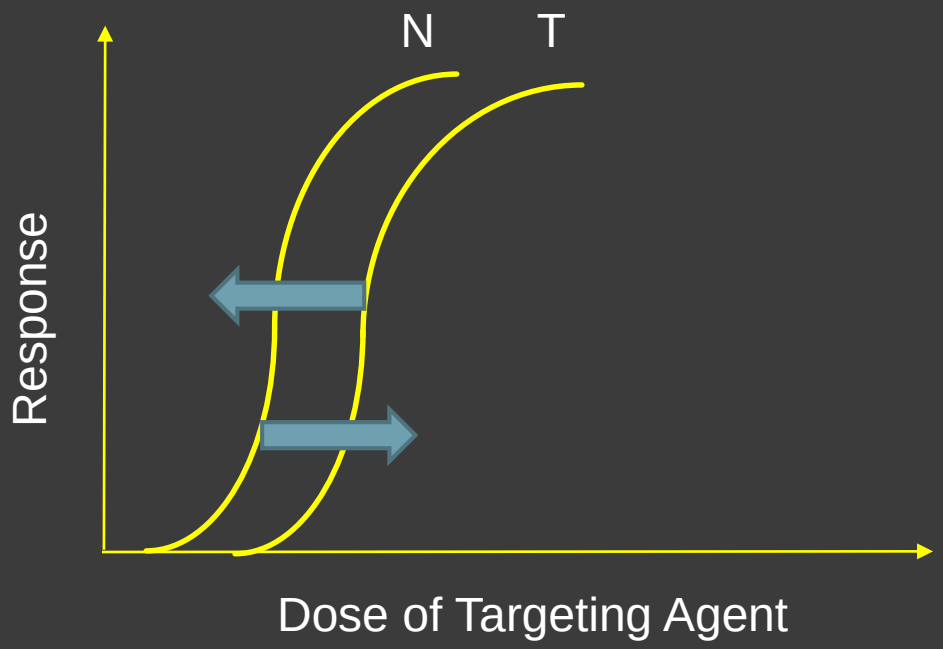





MAY 28, 2001
TIME
THERE IS NEW AMMUNITION IN THE WAR AGAINST CANCER.
THESE ARE THE BULLETS.
Revolutionary new pills like GLEEVEC combat cancer by targeting only the diseased cells. Is this the breakthrough we've been waiting for?
2001

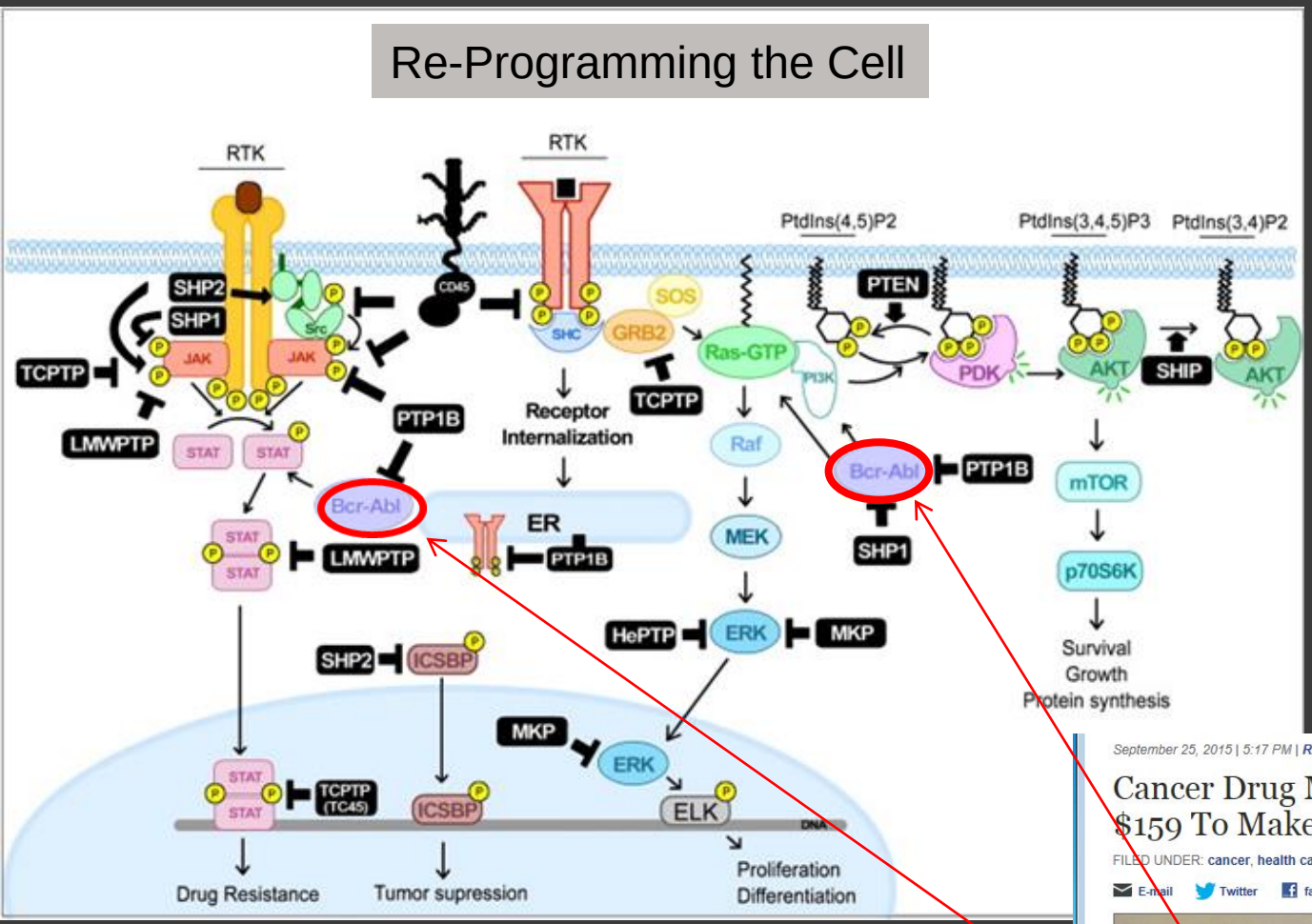

EXOTIC BLEND
Australian Gold
ICED CREME
ACCELERATOR
DARK TANNING FORMULA
WITH COOLING
BRONZER
AND CoQ10

Biology Targeting Strategy



- Physical approaches have reached “saturation”
- Cannot image all cancer cells; doomed to failure
- Radiation alone is less effective
- Targeted drugs work (melanoma, leukemia)
- Tumour diversity requires bio-targeting
- Tissue regeneration for treatment toxicity

Re-Programming the Cell



CML - 15 % of leukemias
Incidence 1.6 per 100,000
of 578 per 100,000
(raw incidence 2012 Ontario)

September 25, 2015 | 5:17 PM | Richard Knox

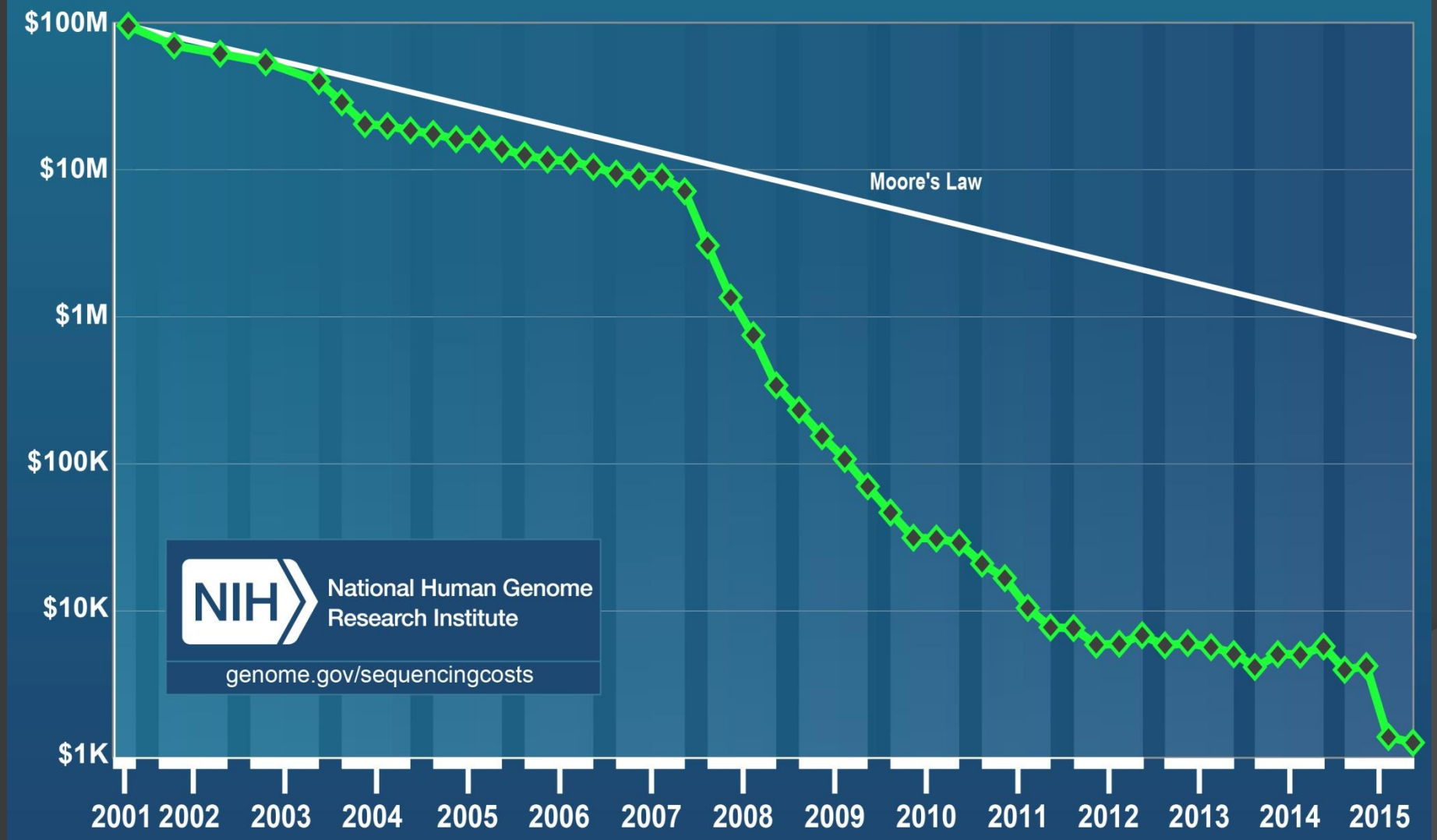
Cancer Drug Mark-Ups: Year Of Gleevec Costs $159 To Make But Sells For $106K

FILED UNDER: cancer, health care costs, pharmaceutical industry

E-mail Twitter facebook

A new study finds that a year's supply of Gleevec (imatinib), a leukemia drug, costs about $159 to make, but the yearly price tag is $106,322 in the U.S. and $31,867 in the U.K. (Wikimedia Commons)

Cost per Genome



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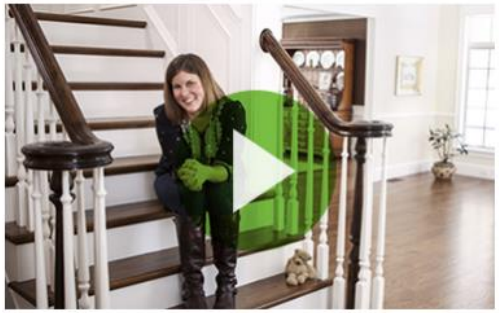
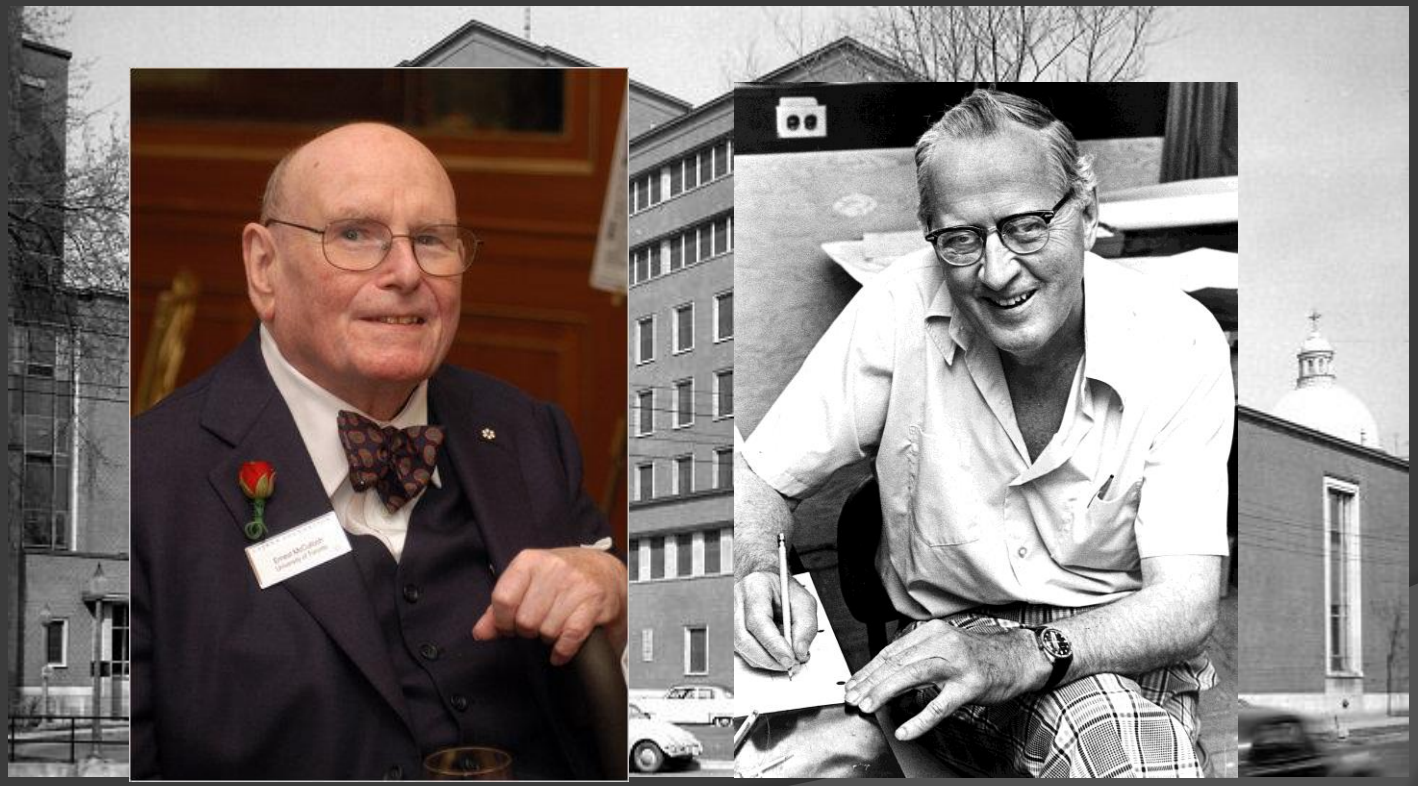


A look back in History

Telegram from E.A McCulloch to H. E. Johns 1962

"Sell betatron. Stop. Sell Cobalt unit. Stop. The cure for cancer will come from polyoma virus research. Stop."



Stem Cells

To Eradicate, you must irradiate!

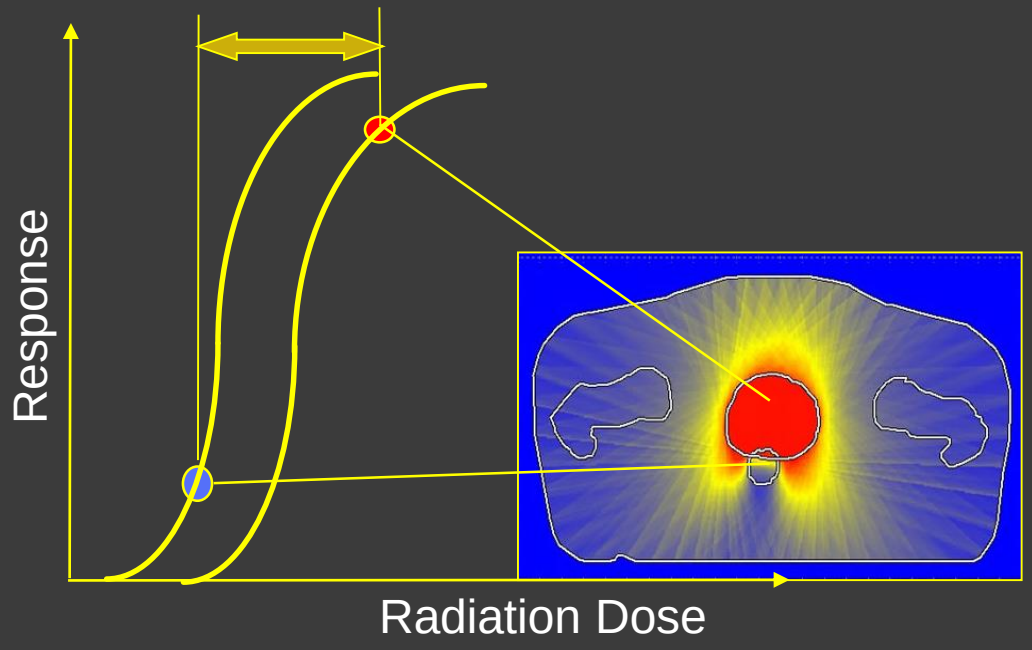
Opinion of Radiobiologist

“Early detection (for which imaging should get kudos) and focused treatments (which radiotherapy can do much better than ever before) will increase cancer patient survival impressively.”

DJ Chapman 2016

Chapman, J. D. "Target theory revisited: Why physicists are essential for radiobiology research." *Clinical Oncology* 19.3 (2007): S12.

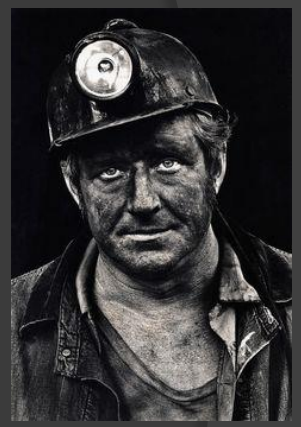
Physical Targeting Strategy



- "Dose sculpting" is targeted/personalized
- A clinical track record in diagnosis/therapy
- Radiation therapy is very Cost-Effective
  - $184 B could save 27 M life-years (Atun et al. 2016)
    - $ 6,800 /life-year saved
- Future roles in heavy ions, radiomics, BART

Costs in Perspective

PROCEDURE	COST ($/yr of life saved)
Mine Safety	1,000,000
Radiation Protection	16,000
Auto Safety (Air Bags)	8,000
Radiation Therapy (Global)	<6,800
Traffic Barrier (Median)	5,700
Feed the Poor	125



A Personal View

Cancer is genomic disequilibrium of DNA damage/repair

Cells have a complex integrated system with dynamic feedback loops to maintain survival.

Combined Therapies is a “must” to cope with tumour obscurity, heterogeneity and adaptability

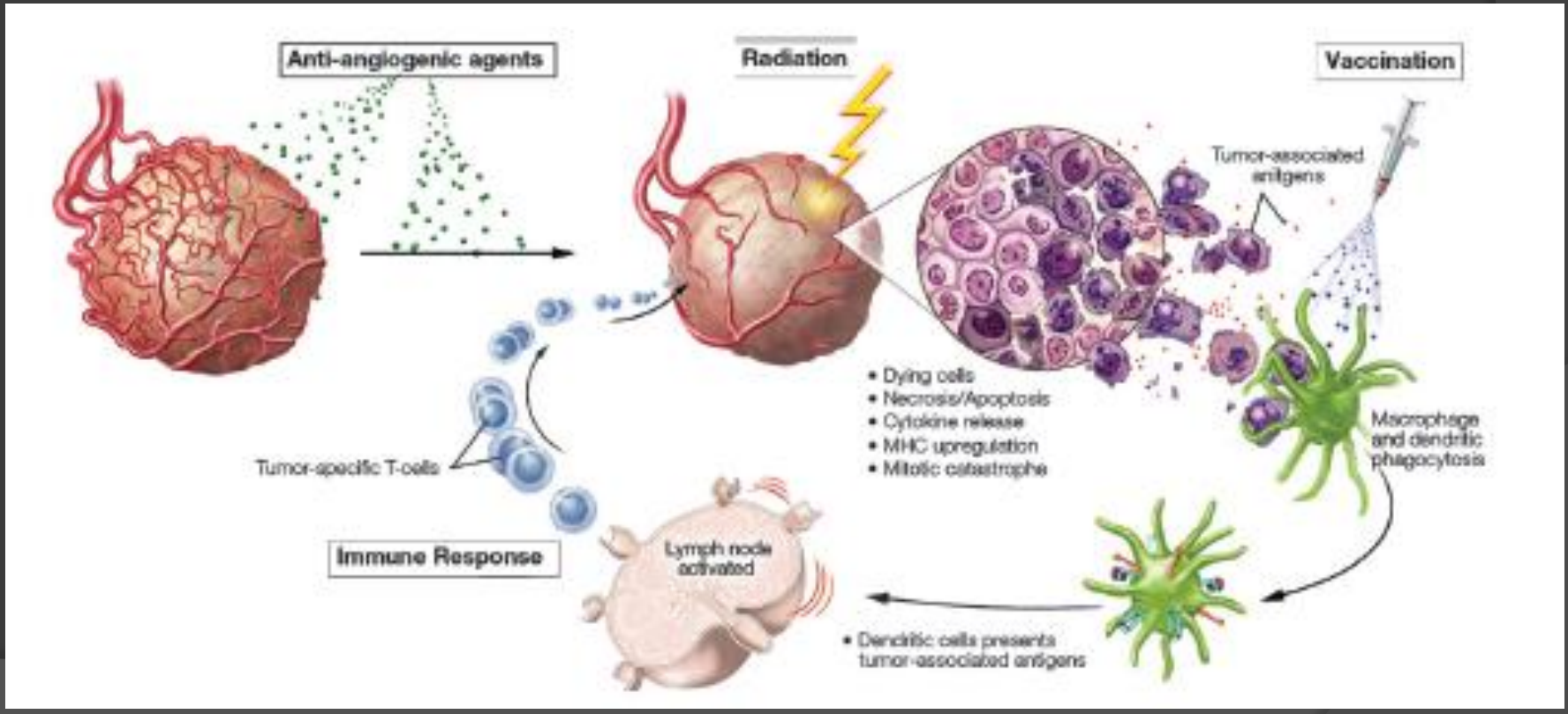
Tumour cells are “smart”.
We just need to be “smarter” !

REVIEW www.rsc.org/molecularbiosystems | Molecular BioSystems

Combining radiation, immunotherapy, and antiangiogenesis agents in the management of cancer: the Three Musketeers or just another quixotic combination?

Mitchell Kamrava,†[a] Michael B. Bernstein,†[b] Kevin Camphausen[a] and James W. Hodge*[b]

Received 9th June 2009, Accepted 17th July 2009
First published as an Advance Article on the web 27th August 2009
DOI: 10.1039/b911313b



Conclusions

Your timing is good
Cancer and Heart Disease demands will crest

CAMPEP-PhD keeps many career doors open
(clinical, industry, academic)

Global international demand is unmet and could save millions of lives

Medical Physics is a “safe” option for several decades
Enhance your collaboration with biologists
Expand your administrative skill set

Other Tools you will eventually need

- Inter-Professional Communication
  - Diplomacy
  - Public Relations
  - Lay explanations
- Financial Management
  - Budgets
  - Procurement
- Human Resources
  - Staffing Algorithms
  - Conflict resolution
  - Labour law
- Intellectual Property
  - Research Contract
  - Intellectual Property

http://businessblog.winweb.com/cloud-computing/7-big-ideas-for-your-business-toolbox

It ain't the roads we take; it's what's inside of us that makes us turn out the way we do.

(O. Henry)

izquotes.com

Life is very Stochastic.

Getting Ready for a Clinical Physics Career: Is this the right choice for you?

Jerry Battista, PhD, FCCPM, FAAPM, FCOMP

Professor, Departments of Oncology and Medical Biophysics, Western University

Director, Physics Research & Education
London Regional Cancer Program

London, Canada

Colourful
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