Workforce/Manpower FTE Standards

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Chair, AAPM Workforce Assessment Committee

Presentation Outline

Current Manpower Resources and Models
- Abt Model
- Battista Model
- Mills Model (work in progress)

Current Manpower Initiatives
- Intersociety Summit (ASTRO)
- IAEA
- AAMD Workforce study
- AAPM Diagnostic Workforce Study
- Other Workforce Studies (Academic, Resource Models)

Conclusions

Objectives

1. Understand the current need to establish recommended personnel staffing levels in radiation oncology physics and imaging physics.
2. Understand the information documented in the Abt studies and other manpower and staffing resources.
3. Understand a current model that predicts the supply and demand for radiation oncology physicists and medical dosimetrists through 2020.

Abt Associates Model (2008)

"I hear you worked so many hours you passed out for 20 minutes. I just thought I'd make it clear that I'm not paying you for those 20 minutes."

Abt-III? What (who) is that?

Abt Associates, Inc. is one of the nation's most respected medical economics consulting organizations – after all look at the client list which includes the AAPM and ACR!

The Abt-III study measures medical physicist work for both routine and special procedures

How? Thought you would never ask!

How did the survey measure Qualified Medical Physicist work?

Collected time estimates (non-procedural and procedural) associated with providing medical physics services

Collected intensity estimates for each service relative to the baseline service

Collected service-mix data (annual number of procedures provided by service)

Analyzed survey data to develop preliminary QMP work estimates by service

What is procedural time and what is non-procedural time?

- Procedural time is that spent with a specific patient, performing a service for that patient (including the time to bill the patient)
- Non-procedural time is that spent with equipment – commissioning, daily and monthly checks, annuals, recommissionings after repair, etc.

Once we have time, how do we measure work?

- Work = time X intensity
- We select a common representative procedure and use it as a benchmark with intensity = 1.0
- The preliminary panel selected 77336 as our benchmark and assigned it an intensity of 1.0
- Respondents assigned all other procedures an intensity using 77336 as a reverence

QMP Work (table 1)

CPT	Procedure	Time	Inten.	Work
77295	Simulation 3-D	1.18	2.00	1.63
77300	Bas Dos Calc	0.55	1.00	0.49
77301	IMRT Tx Plan	4.53	6.00	28.66
77305	S Isodose	0.69	1.00	0.69
77310	I Isodose	0.78	1.28	0.83
77315	C Isodose	0.98	1.50	1.65
77321	Tele Port Plan	1.07	1.50	1.64

QMP Work (table 2)

CPT	Procedure	Time	Inten.	Work
77326	S Br Isodose	2.52	2.00	3.88
77327	I Br Isodose	2.70	2.00	5.64
77328	C Br Isodose	4.78	3.00	11.98
77331	Sp Dosimetry	2.06	1.65	2.66
77332	S Tx Device	0.13	0.70	0.12
77333	I Tx Device	0.34	1.00	0.30
77334	C Tx Device	0.24	1.00	0.45

QMP Work (table 3)

CPT	Procedure	Time	Inten.	Work
77336	Continuing MP Consultation	1.00	1.00	1.00
77370	Special MP Consultation	3.45	3.38	13.94
77781	HDR 1-4	2.70	2.0	5.7
77782	HDR 5-8	3.79	2.5	10.3
77783	HDR 9-12	4.79	3.0	14.7
77784	HDR >12	3.43	3.0	13.9

OK, how about median overall staffing information?

# Patients treated per year	595
# Qualified Medical Physicists	2.0
# Radiation Oncologists	3.0
# Dosimetrists or Junior Medical Physicists	3.0
# Maintenance Engineers	0.0
# Radiation Therapists	8.0
# Radiation Oncology Nurses	3.0

How can we use this data?

- We use it to defend staffing levels
- We use it to defend QMP work effort
- We also use it to establish patient charges
- Physicians use a similar cost study to defend reimbursement amounts from CMS
- However, instead of relying on accountants, economists, and lobbyists, we have to learn to use this information ourselves to negotiate compensation and staffing

What steps to I follow to defend staffing levels?

- Measure your patient load in new patients per year
- Determine the median caseload for your practice type
- Determine the median staffing levels for that practice type
- Calculate your institutional staffing based on your patient load

How do I defend the effort to provide physics services at my institution?

- Determine the number and type of physics services your institution provides annually
- Use the median service mix and the median times per procedure in the 2007 Abt report to calculate the median procedure-hours provided by a medical physicist
- Use this information to show the service-hours provided by your program with reference to a national median standard

What is the difference between defending staffing and work?

- Staffing applies to the entire medical physics program, work applies only to the QMP
- Staffing may include non-professional effort, QMP work is professional in nature
- For professionals, work is directly related to compensation with respect to services provided, staffing is not

Battista Model

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

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

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Please Select > Ontario FTE_Weights

ITEM	WORKLOAD	Physicist	Physics Assistant	Dosimetrist / Treatment Planner	Engineering Electronics	Engineering Mechanical	Computer Support
CLINICAL PROCEDURES and SERVICES							
All radiation beam/source therapy - includes external beam therapy and brachytherapy (cases/yr)	1080	0.54	0.22	2.16	0.00	0.22	0.11
Complexity bonus increment for inverse IMRT including tomotherapy, clinical trial protocols, gated beams, 4D plans, multi-modality image fusion (cases/yr) .	300	0.45	0.00	0.90	0.00	0.00	0.09
External beam - special procedure bonus increment (total body photon or electron, radiosurgery) (cases/yr)	100	0.50	0.25	0.10	0.00	0.10	0.00
Brachytherapy - LDR or HDR (fractions/yr)	100	0.20	0.05	0.04	0.00	0.00	0.00
Brachytherapy - interstitial seed implants (cases/yr)	40	0.20	0.08	0.08	0.00	0.00	0.00
RADIOTHERAPY EQUIPMENT SUPPORT							
Number of accelerators (all linacs, including tomotherapy and robotic linacs)	5	1.00	1.50	0.00	1.50	0.50	0.00
Major ancillary RT equipment: TPS (1 per vendor per 10 workstations), PET-CT, MR-Sim, 4D CTsim, HDR	6	0.60	0.30	0.00	1.20	0.30	0.60
Minor ancillary RT equipment: X-ray Sim, CT-Sim, LDR unit, Cobalt unit, Gamma Knife, orthovoltage unit, ultrasound unit, gating/motion monitoring device	4	0.20	0.10	0.00	0.40	0.20	0.00
TRAINING and EDUCATION of specialists							
Radiation Oncology Residents*	6	0.16	0.00	0.30	0.00	0.00	0.00
Radiation Therapy Students*	6	0.12	0.00	0.30	0.00	0.00	0.00
Clinical Physics Residents*	2	0.30	0.00	0.10	0.00	0.00	0.00
Medical Physics Graduate Students*		0.00	0.00	0.00	0.00	0.00	0.00
* Baseline + weight per trainee for Physicists							
SubTotals		4.27	2.50	3.98	3.10	1.32	0.80
Administration & Other Duties							
Administrative workload per staff category (Human Resources)		0.43	0.05	0.08	0.06	0.03	0.02
Administration (by Chief, Radiation Safety Officer)		0.66	0.00	0.00	0.00	0.00	0.00
Clinical development, conference attendance, courses, site visits		1.23	0.03	0.04	0.03	0.01	0.01
Time away for paid holidays and vacation (FTE per employee)		0.62	0.25	0.40	0.31	0.13	0.08
Total required staff of each type		**6.78**	**2.77**	**4.42**	**3.44**	**1.46**	**0.89**
Total Physics Staff (including dosimetrists/Tx Planner)	**19.77**						
Current Staffing (with approved budget)		6.00	3.00	6.00	2.00	1.00	1.00
Your desired staffing (best estimate)		6.00	3.00	6.00	2.00	1.00	1.00
Number of clinical hours of operation/day		10.00					
Predicted staff per Linac		1.36	0.55	0.88	0.69	0.29	0.18
Cases per predicted staff		159.30	389.42	244.22	313.55	738.60	1218.05

Ontario Model Inputs – Clinical Procedures and Services

Clinical Procedures and Services
All radiation beam/source therapy – includes external beam and brachy therapy
Complexity bonus increment for IMRT, TomoTherapy, Gating, Fusion, Cl. Trials
External Beam special procedure bonus increment – TBE, TSE, SRS
Brachytherapy – LDR or HDR
Brachytherapy – interstitial seeds

Ontario Model Inputs – Radiotherapy Equipment Support

Radiotherapy Equipment Support
Number of accelerators – including TomoTherapy and Robotic units
Major ancillary RT equipment including TPS, PET-CT, MR-Sim, 4-DCT-Sim, HDR
Minor ancillary RT equipment including X-ray Sim, CT – Sim, Gating, Ultrasound

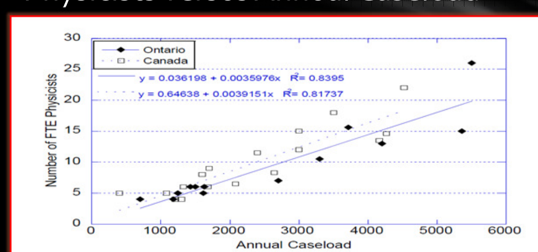
Ontario Model Inputs – Training and Education of Specialists

Training and Education of Specialists
Radiation Oncology Residents
Radiation Therapy Students
Clinical Physics Residents
Medical Physics Graduate Students

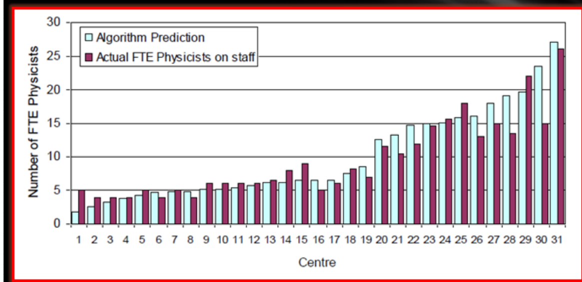
Ontario Model Inputs – Administration & Other Duties

Administration and Other Duties
Administrative Workload per Staff Category
Administration (By Chief Physicist, Radiation Safety Officer)
Clinical Development, Conference Attendance, Courses, Site Visits
Time Away for Paid Holidays and Vacations (FTE per Employee)

Physicists versus Annual Caseload



Inverse slope:
Ontario: 278 treated cases/physicist
Canada: 255 treated cases/physicist



Summary

Ontario study provides a methodology for determining staffing requirements

- Validated by trans-Canada survey
- Works in the Canadian context

Includes considerations for various support staff

The simple formula could be adapted by deriving new ratios for various special procedures

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Mills Model

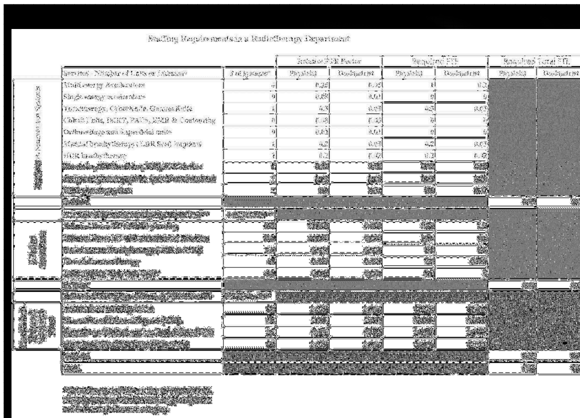
Currently a Work in Progress

Validated for Abt III Matrix Results

Validated for the matrix published in the ACR/ASTRO Radiation Oncology Accreditation Program Requirements Guide

Validated for the AAMD Workforce Survey Matrix Results

Not validated for the ACR/ASTRO Accredited Program Database


Staffing Requirements in a Radiotherapy Department

Intersociety Summit (ASTRO)

American Society for Radiation Oncology

Intersociety Summit

Vanderbilt Hall Hotel, Newport RI

May 6-7, 2011

Project: Revision of Bluebook

Stakeholders: ASTRO (lead organization), ACR, ABR, AAPM, ASRT, ABS, SROA, AAMD, AFROC

Process: Assign representatives from stakeholder groups to each chapter. Ensure that there is appropriate expertise and balance (community versus academic centers) in each writing group.

Intersociety Summit (Blue Book)

Outline:

Preamble

o Rationale, vision, scope

Process of Care in Radiation Oncology

o Draw from ACR/ASTRO coding guide

o EFOMP reports

o IAEA reports

o Multidisciplinary care (e.g., interactions with surgeons, pathology, medical oncologists, tumor boards, etc.)

The Radiation Oncology Team

o Roles and responsibilities

o Qualification/training

o Staffing requirements

§ Relate these to technologies

§ Utilization metrics

§ Accreditation data

§ AAPM workforce study

o Continued training

§ CME/MOC

Blue Book (2012?)

Equipment
o Hardware
§ Relate equipment requirements to purpose
o Software
§ Relate software requirements to purpose
o Interconnectivity and interoperability
o Acceptance testing and commissioning
o Independent checks
Safety
o Culture of safety
§ Role and responsibility of each team member
§ Empowering team members
§ Checklists

Quality Assurance
o Software
o Hardware (procedures specific)
§ Simple RT
§ 3DCRT
§ IMRT
§ SBRT
§ IGRT
§ Brachytherapy (HDR, LDR)
o Process
o Use QA white papers as basis
o Add process component

Blue Book (ASTRO)

Culture of ASTRO

Highest leadership and Staff make policy

The process is less inclusive than you find in the AAPM

Decisions take a long time

Projects take a long time (especially collaborative projects)

It is sometimes difficult to get information

Information is often released slowly and deliberately

The Intersociety leaders want a very simple staffing model – basically one number for each profession

This desired number is irrespective of the type of practice or patient volume.

There was some mild interest in the Mills model, but some resistance as well.

The objections were:
- The model is too complex, even if a filled out example is offered
- The model is insufficiently validated – is should be published before referenced
- The model may not be appropriate for certain institutions

The Blue Book is currently still being reviewed as a Draft Document

IAEA – Vienna, Austria

Meeting dates:

January 31 – February 2, 2011

October 31 – November 4, 2011

18 International Representatives

Embraces all staff in radiation medicine

Staffing categories in radiation oncology are based on work categories, not profession categories as different professions may perform the same work:
- Radiation oncology
- Medical physics
- Radiation therapy
- Treatment planning
- Radiation oncology nursing
- Information technology
- Engineering mechanical
- Engineering electronics

IAEA – Vienna, Austria

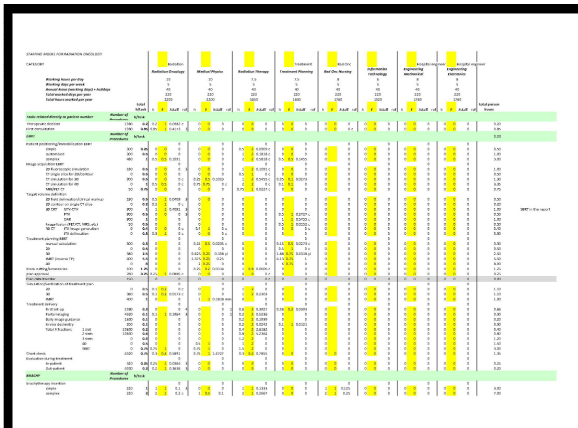
The philosophy of the IAEA group was to divide the staffing by type of work and to determine all of the components of that type of work

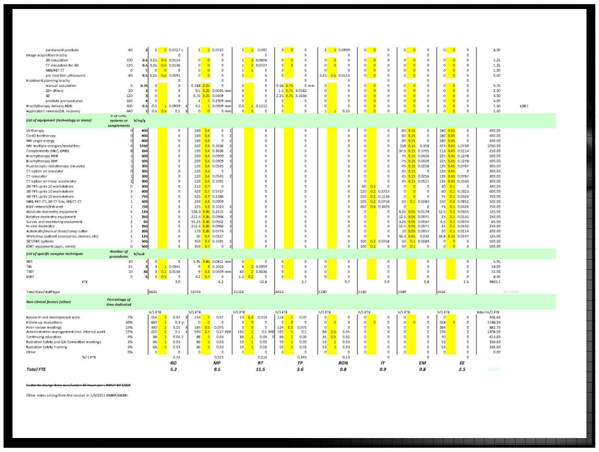
The Abt and Battista staffing numbers were roughly equivalent, but the Canadian institutions tend to staff somewhat more generously than their US counterparts.

As a first approximation, it was felt that the Abt data provided the best patient procedure manpower estimates and the Battista - Canadian data provided the best equipment-based manpower estimates.

IAEA – Abt, Mills and Battista Data

Merging the Abt and Battista data proved problematic
- The Abt data was stripped of non-procedural (equipment) time and work
- The Battista data was stripped of patient time and work
- The result of adding these two is that staffing for medical physics work was overestimated
- The conclusion is that either the Battista model overestimates machine activities at the expense of patient procedure time and work, or the Abt model overestimates patient procedure time and work at the expense of machine services, or both
- The Mills model seemed to provide better results, but was considered to simplistic a model to be of use.





IAEA – Vienna, Austria

Summary

The models and data sets are currently undergoing revision and final review

The IAEA spreadsheet model is highly complex and comprehensive, but difficult to implement

There is some concern the final model will be dominated by staffing levels in developed countries and not reflect the dominate worldwide reality of practices

Publication date is anticipated later this year (2012)

AAMD Workforce Study

The AAMD Workforce Study Consists of Five Components:

- Membership Survey (Similar to that conducted by The Center for Health Workforce Studies, School of Public Health, University at Albany
- Workforce Survey (Similar to the Abt III 2008 Report)
- Supply and Demand Study (Similar to Future trends in the supply and demand for radiation oncology physicists, Michael D. Mills, Judah Thornewill, and Robert Esterhay, JACMP (11) 2, 2010.)
- Complexity Survey (conducted of professional colleagues of medical dosimetrists)
- Interviews (conducted with selected representatives of the medical dosimetry community)

QMDs and QMPs – some thoughts

Comparing the service mix and the work hours of the median QMD and QMP, there is almost an exact overlap of both services and work hours by code

Staffing of the QMD and QMP also match closely in the Abt study, the Battista study, the IAEA study and the ACR/ASTRO Radiation Oncology Accreditation Program Requirements Guide. The new Blue Book is likely to publish identical staffing numbers for medical physicists and medical dosimetrists

Supply and demand curves are different for QMDs and QMPs. However, both show that as additional qualifications to take the professional boards are emerging and as the baby boom generation retires, there are anticipated shortages in the supply of both professions toward the end of the decade.

Diagnostic Workforce Study

Designed by Michael Mills and Ed Nickoloff

Created October 12, 2011

Survey opened on November 8 2012

Closed survey on February 27, 2012 with 460 responses

Purpose was to measure medical physicist staffing and workload by type of equipment

Purpose was also to assign a medical physicist cost per patient procedure for each type of equipment

Diagnostic Workforce - Analysis

All calculations are performed for each individual medical physicist

- Identify the medical physicist by specialty (% diagnostic, nuclear medicine, radiation oncology, and health physics)
- Identify the medical physicist by vocation (% clinical, research, administration, teaching, other responsibilities)
- Survey and report median equipment costs: detectors, phantoms, calibrations
- Determine a median annual equipment cost
- Determine an equipment mix annual equipment cost for each medical physicist
- Survey and report the equipment mix profile – types and numbers for each medical physicist
- Survey and report the average number of procedures for the equipment serviced

Diagnostic Workforce – Analysis (cont.)

- Report the initial commissioning hours by equipment type
- Report the annual support hours by equipment type
- Calculate annual equipment and labor costs to service each equipment type
- Calculate the median medical physicist equipment and labor costs by equipment type
- Calculate the median service profile for a medical physicist supporting imaging equipment
- Calculate the median cost per patient procedure by equipment type consequent to medical physicist services
- Calculate a staffing model by equipment profile based on the equipment mix and productivity of the median medical physicist

Diagnostic Workforce Summary

We expected to see larger differences between physicists working in academic centers and those serving community hospitals

Most medical physicists providing imaging and nuclear medicine services are about 50% clinical

Other duties are administration, teaching and research

There are a few (about 10% of the total reporting) highly productive full time consulting medical physicists who are 100 percent clinical and demonstrate about twice the median productivity

These individuals do not impact the median numbers reported

Other Workforce Studies

Academic Workforce Study

While much effort has been devoted to examining how clinical medical physicists spend their time and to supply and demand issues, the academic community has not been studied

The research community is dependent on the availability of funding from both the government and commercial sources

Little information exists respecting the historic available of funding nor of the numbers of full-time research positions

Survey of Physics Resources for Radiation Oncology Special Procedures

A study similar to the 1998 investigation sponsored by the ACMP

Special procedures are treated as a business plan

Start-up costs include equipment and labor.

A ramp-up of patient special procedures will be modeled.

The result is a clearer understanding of the resources needed to provide safety and quality for patient procedures

Conclusions

With respect to medical physics workforce problems and issues, some progress has been made

Questions of safety and quality are clearly impacted by workforce issues

We need to drill deeper to understand how to provide efficient clinical services safely

We need better information and more comprehensive databases to address these issues

We also need to develop a conceptual approach to measure manpower needs and supply/demand information for research medical physicists