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)

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)

<table>
<thead>
<tr>
<th>CPT</th>
<th>Procedure</th>
<th>Time</th>
<th>Inten.</th>
<th>Work</th>
</tr>
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<tr>
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### QMP Work (table 2)

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<tr>
<td>77333</td>
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### QMP Work (table 3)

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<td>Continuing MP Consultation</td>
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<td>77370</td>
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</table>

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 do 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

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

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Canada

Atlantic

Canada

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3/20/2012
Ontario Model Inputs – Clinical Procedures and Services

**Clinical Procedures and Services**

- All radiation beam/source therapy – includes external beam and brachytherapy
- Complexity bonus increment for IMRT, TomoTherapy, Gating, Fusion, CdR 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, O-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: 292 treated cases/physicist
- Canada: 255 treated cases/physicist
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
Blue Book (2012?)

Equipment
- Software
- Hardware

Quality Assurance
- Procedures specific
- Simple RT
- 3DCRT
- IMRT
- SBRT
- IGRT
- Brachytherapy (HDR, LDR)

Process
- Acceptance testing and commissioning
- Independent checks

Safety
- Process component

Culture
- Use QA white papers as basis
- Add process component

Role
- Relate equipment requirements to purpose
- Relate software requirements to purpose
- Consistency and interoperability
- Acceptance testing and commissioning
- Independent checks

Culture of Safety
- Empowering team members
- Checklists

IAEA – Vienna, Austria

Meeting dates:
January 31 – February 2, 2011
October 31 – November 4, 2011

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 the staffing. The staffing numbers were roughly equivalent, but the Canadian model appeared to staff some work less than that of the 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, Judith 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 AAPM Special Procedures Committee is recommended 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