Diagnostic Workforce and Manpower Survey – Part 1, History and Introduction
Edward L. Nickoloff, ScD and Michael D. Mills, PhD

Outline
- History of Diagnostic Staffing Reports
  - 1991 AAPM Report No. 33 of Task Group 5
  - 1993 AAPM ACMP Bilateral Recommendations on Physics Staffing for Diagnostic Radiology
  - 1995, 2003 and 2008 Abt Reports for Radiation Oncology Physics Services – Philosophy as applied to diagnostic staffing
- Design of survey instrument
- Limitations of survey instrument
- Difference between staffing and professional workload

History of Imaging Physics Staffing Reports
AAPM Report 33 and AAPM ACMP Bilateral Recommendations on Physics Staffing for Diagnostic Radiology
Diagnostic physicists provide professional services for selecting, evaluating, monitoring and optimizing imaging devices. Staff size recommendations are based on the equipment inventory. Emphasis is placed on the primary physics needs generated by each piece of equipment. Variations in needs between types of institutions have not been addressed. Physics staffing must also address educational services, administrative, regulatory and accreditation work.

### Diagnostic X-ray Staffing Recommendations FTE

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile radiography unit</td>
<td>0.015</td>
</tr>
<tr>
<td>General x-ray room</td>
<td>0.015</td>
</tr>
<tr>
<td>Mobile fluoroscopy</td>
<td>0.03</td>
</tr>
<tr>
<td>R/F room</td>
<td>0.05</td>
</tr>
<tr>
<td>Special procedures room</td>
<td>0.08</td>
</tr>
<tr>
<td>Digital system</td>
<td>0.04</td>
</tr>
<tr>
<td>CT scanner</td>
<td>0.08</td>
</tr>
</tbody>
</table>
**AAPM Report 33 – April 1991**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>FTEs per Equipment</th>
<th>Recommended FTEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Medicine, Ultrasound and MRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>For each scintillation camera</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>For each image processing computer</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>For each SPECT</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>For each PET</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>For each ultrasound scanner</td>
<td>0.015</td>
<td></td>
</tr>
<tr>
<td>For each MRI</td>
<td>0.1 – 0.25</td>
<td></td>
</tr>
</tbody>
</table>

* To be determined in accordance with need

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**Equipment of a facility and FTE physicists & support staff are summarized:**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>FTEs per Equipment</th>
<th>Recommended FTEs</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 general x-ray rooms</td>
<td>0.015/room</td>
<td>0.15</td>
</tr>
<tr>
<td>4 RF rooms</td>
<td>0.05/room</td>
<td>0.20</td>
</tr>
<tr>
<td>3 special procedure rooms</td>
<td>0.08/room</td>
<td>0.24</td>
</tr>
<tr>
<td>2 digital systems</td>
<td>0.04/system</td>
<td>0.08</td>
</tr>
<tr>
<td>1 CT scanner</td>
<td>0.08/room</td>
<td>0.08</td>
</tr>
<tr>
<td>5 portable rad units</td>
<td>0.015/unit</td>
<td>0.075</td>
</tr>
<tr>
<td>2 portable fluoro units</td>
<td>0.05/unit</td>
<td>0.06</td>
</tr>
<tr>
<td>2 nuc med images</td>
<td>0.10/unit</td>
<td>0.20</td>
</tr>
<tr>
<td>1 image processing computer</td>
<td>0.25/unit</td>
<td>0.25</td>
</tr>
<tr>
<td>1 SPECT unit</td>
<td>0.35/unit</td>
<td>0.35</td>
</tr>
<tr>
<td>4 ultrasound units</td>
<td>0.015/unit</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1.72</strong></td>
<td></td>
</tr>
</tbody>
</table>

Support staffing recommendation is 1.5 FTE support staff per physicist.

Practical Staffing: 2.0 FTE Physicists and 2.6 (1.5 x 1.75) FTE Support Staff

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**AAPM Report 33 – April 1991 – Final Thoughts**

- Many new types of diagnostic imaging equipment have been released in the intervening years
- In some cases, the practice of diagnostic imaging physics has become more efficient
- In almost every case, the imaging equipment has become more complex, requiring additional expertise and more sophisticated performance measurement equipment
- AAPM Report 33 has never been superseded! It remains the current AAPM reference document for diagnostic imaging staffing!
Members of the Trilateral Task Force: AAPM, ACMP and ACR Commission on Physics
- Edward Nickoloff (Chair)
- Stewart Bushong (AAPM)
- Charles Kelsey (AAPM)
- James Kereiakes (ACR)
- Mark Mishkin, MD (ACR)
- Lawrence Rothenberg (ACMP)
- Louis Wagner (AAPM)

Contributing Consultants
- James Deye
- Thomas Payne
- Ray Tanner

### Staff recommendations for diagnostic radiology - 1993

<table>
<thead>
<tr>
<th>Type of Diagnostic Equipment</th>
<th>Recommended Physicist Staff**</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-ray***</td>
<td>1 FTE/40 x-ray tubes</td>
</tr>
<tr>
<td>ultrasound</td>
<td>1 FTE/50 units</td>
</tr>
<tr>
<td>nuclear medicine</td>
<td>1 FTE/8 imagers</td>
</tr>
<tr>
<td>MRI</td>
<td>0.1 – 0.3 FTE per MR unit</td>
</tr>
<tr>
<td>PET</td>
<td>no recommendation</td>
</tr>
</tbody>
</table>

*Support staff is 1.5 FTE per physicist, including QC and rad safety technologists
**For routine clinical duties; does not include staff for teaching and research
***Includes radiographic, fluoroscopic, tomographic, mammographic, portables & CT
****One FTE is equivalent to one person working 230 8-hour days per year

This staffing document was considerably simplified as compared to AAPM Report 33
- It represented an heroic effort to get agreement with all societies then representing the professional concerns of imaging medical physicists
- The document was not endorsed by the ACR, but was supported by the AAPM and ACMP
- It remains the most recent diagnostic staffing document to receive endorsement by the AAPM

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Abt reports for radiation oncology physics services
- philosophy
Based on Abt surveys conducted in 1995, 2002 and 2007

Philosophy and assumptions:
- Medical physics work is professional in nature and must be performed by credentialed and qualified individuals
- The time and effort associated with completing medical physics procedures may be measured and tabulated
- The physicist time and effort must be surveyed and reported separately from support staff time
- The survey must allow for and accommodate variations in practice location or practice type

Philosophy and assumptions (cont.):
- Medical physicists perform tasks that are associated both with equipment and with patient procedures
- The work effort may therefore be reported both on the basis of equipment units and patient procedures
- The number of equipment units and patient procedures may be normalized to the median imaging physicist
- This information may be used to justify physicist staffing and build a business model for the imaging physics section
Design of survey instrument
Diagnostic Workforce and Manpower Survey - 2012

Application of Abt report philosophy to diagnostic staffing
- Physicists reported:
  - Time per unit
  - Weekly patients per unit
  - Their time separate from support staff time
  - Their percentage effort by sub-specialty
  - Their location by region of the country
  - Their percentage of time by physics category of service or work
  - Percentage of physics services to type of medical facilities
  - Percentage effort by type of physics support (e.g., do all QC work, supervise support staff, supervise consultants, etc.)

Diagnostic Workforce and Manpower Survey - 2012
- Application of Abt report philosophy to diagnostic staffing
  - Physicists reported (cont.)
    - Regulatory environment in states where services are provided
    - Percentage of support time to various imaging units
    - Performance equipment cost and use by equipment category
    - Number of units for which you personally provide services
    - Number of patient procedures per week on each type of unit
    - Hours of support for initial planning and installation
    - Annual hours of support for each type of unit
How we hope to report the data:

- We wish to report
  - Both the number of hours/year and the % FTE of effort for the imaging QMP to support a unit of equipment
  - The cost in equipment, salary and benefits to provide imaging QMP support for each unit of equipment
  - The cost of imaging QMP support per patient procedure by category of procedure
  - A business model for the imaging physicist to use to support an imaging section based on:
    - Income from a structured revenue stream based on the cost of providing imaging physics support for patient procedures
    - Needed support for equipment, salaries, benefits and space

Limitations of the survey instrument

Diagnostic Workforce and Manpower Survey - 2012

Limitations of the Survey

- Imaging physicists do not fall into neat categories.
- Imaging physicists practices vary:
  - Widely by percentage of time devoted to clinical service
  - By practice subspecialty (imaging, NM, HP, therapy, etc.)
  - By the percentage of time devoted to non-clinical activities (education, administration, regulations, etc.)
  - By the nature of the clinical support provided (perform QC, supervise technologists, supervise consultants, etc.)
  - By the regulatory environment and the impact on the time spent on each unit per year
- It is impossible divide imaging physicists neatly as either employees or consultants; the practices are too variable
Limitations of the survey: Diagnostic QMP practice model is undefined:

- Ad Hoc Committee on Defining the Diagnostic QMP Practice Model
  - Chair: Anthony Siebert
  - Charge:
    - Determine what procedures and tasks the Diagnostic (Dx) QMP needs to personally perform in terms of clinical practice.
    - Determine "allowable" procedures and tasks performed by an unqualified assistant under the supervision of the Dx QMP.
    - The level of supervision, direct or general, for each task not performed by the QMP must be explicitly described.
    - Define types of supervision for different circumstances and tasks.

What is the difference between defending staffing and professional 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

Conclusions

- The Diagnostic Workforce and Manpower Study is ambitious and represents the most sophisticated effort to date to measure the work of the imaging QMP
- The results are still being analyzed – this report is a work in progress and the numbers reported should not be cited or referenced
- There is still some discussion of whether to have an outside consulting group perform this study to eliminate any perception of bias in the results