“Diagnostic Workforce Study”

What is the right question to ask?

- “How many diagnostic medical physicists does the U.S. need?”
- “How many diagnostic medical physicists (or how much physics support) does a given facility need?”
- “How much physics support does a given machine, facility, or operation require?”

Overview of prior work to date

Several efforts have quantified diagnostic workforce needs

Another update due; field has changed

These inform our current approach and provide reference data
Past assessments

- AAPM Dx Workforce and Manpower Survey (2012)

AAPM Report 33

<table>
<thead>
<tr>
<th>Amount of Equipment</th>
<th>PTFE Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Anesthesia Cart</td>
<td>0.35 FTE</td>
</tr>
<tr>
<td>2. Mobile fluoroscopy unit</td>
<td>0.35 FTE</td>
</tr>
<tr>
<td>3. Mobile C-arm unit</td>
<td>0.35 FTE</td>
</tr>
<tr>
<td>4. Cardiac catheterization lab</td>
<td>0.35 FTE</td>
</tr>
<tr>
<td>5. Digital angiography lab</td>
<td>0.35 FTE</td>
</tr>
<tr>
<td>6. Interventional suite</td>
<td>0.35 FTE</td>
</tr>
<tr>
<td>7. CT Scan</td>
<td>0.7 FTE</td>
</tr>
<tr>
<td>8. MRI</td>
<td>0.7 FTE</td>
</tr>
<tr>
<td>9. PET and SPECT</td>
<td>0.7 FTE</td>
</tr>
<tr>
<td>10. Digital Radiography</td>
<td>0.7 FTE</td>
</tr>
<tr>
<td>11. Ultrasound</td>
<td>0.35 FTE</td>
</tr>
</tbody>
</table>

Recommended ratio of DXMPs : Support Staff = 1 : 1.5

AAPM-ACMP Recommendations

Worksheet to Determine Recommended Physics Staffing for Diagnostic Radiology
Sunshine survey (2001)

- Random selection of AAPM membership surveyed ca. 2001 regarding past 12 months' work
- 56% response
- 50% of those “do partly or only diagnostic medical physics”
  - 46% of these “only”
  - 54% of these “partly”
- 13% of “only diagnostic” respondents in private practice
2012 AAPM Dx manpower survey

Analysis of collected data suggested conclusions markedly inconsistent with known realities of practice.

Results could not be summarized in a useful form and published.

Lessons Learned I: What to Do

AAPM Report 33: cautioned there’s more to Dx physics work than equipment inventory

AAPM-ACMP blended survey response data with consensus of committee – cross-section of veteran Dx medical physicists

DWWSS members’ perspectives

- Veteran Dx MP who do mostly or all clinical work
- In-house academic, in-house community, and consulting members
- Some members have significant experience in two or more settings
- In-house members from both individual hospitals and health system networks
- Consulting members have special projects and consulting services in addition to routine equipment evaluation and accreditation work for clients of all sizes
Lessons Learned II: What to Change

Categorizing the respondent by practice setting (consultant, in-house, academic, community, etc.):
• useful for demographics to validate respondent population
• appears to confound the data
• We don’t fit neatly into boxes

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Terminology

What does it mean to “support” a machine (CT scanner, MRI scanner, mammography unit, etc.)?
...or to “cover” one?
...or to “be responsible for”?
...or to “consult on”?

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Terminology

• What are “basic” diagnostic medical physics services?

• What are “comprehensive” diagnostic medical physics services?
Practice environments

• What are the real natures of consulting and in-house physics support?

• What are the differences & similarities?

• Are all facilities strictly "academic" or "not"?

• Many of us practice in a blended model


Need to let go of trying to get single authoritative answer from the equipment inventory ...

"... the physics services extend far beyond the support of the listed equipment. The equipment merely serves as an index value for assessment of the needed physics staff." (AAPM Report 33)

New Framework: Levels of Service

• DWWSS developed the Levels of Service (LoS) model

• Attempts to describe and classify DxMP work without relying on traditional practice environment categories

• Published in AAPM Report 301 (May 2017)
Level 1

• Required services, or de facto requirements
• Well-defined
• Relatively high degree of agreement on procedures, time, effort

...EPEs

Level 2

• Well-described
• Frequently the responsibility of a medical physicist*
• Carried out according to published methods, procedures, standards
• Includes mandatory and non-mandatory svcs

... FGI safety program a la NCRP 168 ... RSO

*Not exclusively carried out by medical physicists

Level 3

• Not well-defined
• Not mandatory outside institution
• Broadly: research or developmental activities

... testing new tools & techniques, basic science, clinical research
Level 0

- Essential activities
- Cost of making medical physics services available
- Perhaps negotiable, perhaps necessary

... getting CE, calibrating instruments, maintaining certifications & licenses, operations & personnel mgmt

Appendix 1, Table 1

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>Hours per EPE</th>
<th>Modifier</th>
<th>Total hours per year for Level 1 services only</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQSA physics survey, N/F</td>
<td>Annual MQSA physics services for analog (screen-film) mammography systems. Includes hands-on survey time, QC program review, and report preparation**</td>
<td>6.0</td>
<td>1.3</td>
<td>7.8</td>
</tr>
<tr>
<td>MQSA physics survey, DR only, no DBT*</td>
<td>Annual MQSA physics services for DR systems. Includes hands-on survey time, QC program review, printer and one primary X-ray (view work station) evaluation, and report preparation**</td>
<td>5.0</td>
<td>1.3</td>
<td>6.5</td>
</tr>
<tr>
<td>MQSA physics survey, DBT</td>
<td>Annual MQSA physics services for digital breast tomosynthesis (DBT) systems. Includes hands-on survey time, CE program review, service call</td>
<td>8.0</td>
<td>1.0</td>
<td>14</td>
</tr>
</tbody>
</table>

Appendix 1, cont’d

DxMP could cover ~6-7 of these facilities

...LEVEL 1 ONLY
Validation Needed

- Report 301, Table 1 is an *anecdotal consensus*
- Agrees well with Cypel & Sunshine (2004)
- Cypel & Sunshine collected real data from large # of working physicists – respondent caveats apply
- Mills, Nickoloff, et al. in 2012 collected data from large # of working physicists

Current status

- AAPM Report 301 published in May 2017
  - "An Updated Description of the Professional Practice of Diagnostic and Imaging Medical Physics"
- Formalizes the LoS model
- Describes common duties of DxMP’s
- Tabulates consensus values for time required for Level 1 EPE’s
- SHORT SURVEY IMMINENT

Next steps for DWWSS

- Considering data sources and collection approaches
- Submitted grant application & trying to budget within AAPM
- Validate Level 1 EPE times from Report 301
- Quantify Level 2 work actually being done
- Assess time being spent on Level 3 work
- Estimate demand/market size via state X-ray lists, ACR totals, etc.
Challenges Ahead

Pathway into the workforce
- ABR certification via CAMPEP residency
- Shortage of diagnostic residency programs and slots
- What role can/will DMP programs play?
- A robust workforce needs assessment should help motivate and justify solutions at national level
  - E.g. AAPM-RSNA-SNMMI program startup grants

Medical Physics Assistants
- MPA role in Dx MP is emerging and evolving
- What will be their impact on supply and demand?
- Answer likely to evolve over shorter vs. longer term
Rapid changes in field

• Coming changes in healthcare economics
• Medical Physics 3.0 driving expansion in ways difficult to foretell in detail
• New & expanding Joint Commission, regulatory requirements
• Want model for extrapolation, not "snapshot"
• Trend: $\frac{d^2C}{dt^2} > 0$

Medical Physics Value Proposition

• DxMP community often does not communicate its value well

• Difficult to capture, quantify value of much of what we do via questionnaires.

Our value reaches beyond testing equipment.

Challenge

“Like radiologists, [Dx] medical physicists need to decide if it is time to switch to a role that is based on value or stay with one in which their worth is based on volume.”

Geiser, JACR, online Dec. 2014
Thank you