Modeling Medical Physicist Supply and Demand

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Overview

- Today’s context and the future of the medical physicist workforce
- Basic model specifications
- Supply and demand scenarios
- Conclusions and key questions
Today’s Context

- Today’s context and the future of the medical physicist workforce
- Basic model specifications
- Supply and demand scenarios
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Basic Model Specifications

- Today’s context and the future of the medical physicist workforce
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Basic Model Specifications

Afghanistan Stability / COIN Dynamics

COALITION CAPACITY & PRIORITIES

CENTRAL GOVT'

OVERALL GOVERNMENT CAPACITY

TRIBAL GOVERNANCE

POPULATION CONDITIONS & BELIEFS

POPULAR SUPPORT

INFRASTRUCTURE SERVICES & ECONOMY

INSURGENTS

NARCOTICS

OUTSIDE SUPPORT TO INSURGENT Factions

Basic Model Specifications
Basic Model Specifications: Supply Model

Basic Supply Model

- Starting Career
- In Training
- Completing Residency
- Early Career
- Advancing to Mid Career
- Mid Career
- Advancing to Late Career
- Late Career
- Continuing Past 40 Years
- Entering Residency Training
- Attrition from Residency
- Leaving Profession EC
- Leaving Profession MC
- Leaving Profession LC
Basic Model Specifications: Supply Model

- New medical physicists entering the profession annually:
  - Radiation Oncology: 188 (48 clinical residencies; 140 other)
  - Diagnostic Imaging: 24 (7 clinical residencies; 17 other)

- Exiting the profession:

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Early Career</th>
<th>Mid Career</th>
<th>Late Career</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiation Oncology</td>
<td>1%</td>
<td>3%</td>
<td>34%</td>
</tr>
<tr>
<td>Diagnostic Imaging</td>
<td>1%</td>
<td>3%</td>
<td>38%</td>
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</table>
Basic Model Specifications: Demand Model
Basic Model Specifications: Demand Model

- Demand basis rate projections

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Cancer Incidence</th>
<th>U.S. Population</th>
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<tr>
<td>2000-2009</td>
<td>1.84%</td>
<td>0.98%</td>
</tr>
<tr>
<td>2010-2019</td>
<td>2.12%</td>
<td>0.96%</td>
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<tr>
<td>2020-2029</td>
<td>1.74%</td>
<td>0.90%</td>
</tr>
<tr>
<td>2030-2040</td>
<td>1.08%</td>
<td>0.83%</td>
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</table>

- Demand to MP FTE Ratio:
  Radiation Oncology: 304 new cancer patients per FTE
  Diagnostic Imaging: 736,000 population per FTE
### Basic Model Specifications: Demand Model

#### Median FTE rates:

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Early Career</th>
<th>Mid Career</th>
<th>Late Career</th>
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</thead>
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<td>0.8136</td>
<td>0.7844</td>
<td>0.8250</td>
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<tr>
<td>Radiation Oncology Uncertified</td>
<td>0.8333</td>
<td>0.8167</td>
<td>0.8479</td>
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<tr>
<td>Diagnostic Imaging Certified</td>
<td>0.5600</td>
<td>0.5720</td>
<td>0.4320</td>
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<tr>
<td>Diagnostic Imaging Uncertified</td>
<td>0.6000</td>
<td>0.5950</td>
<td>0.2000</td>
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</table>
Supply and Demand Scenarios

- Today’s context and the future of the medical physicist workforce
- Basic model specifications
- Supply and demand scenarios
- Conclusions and key questions
Supply and Demand Scenarios

Supply Scenarios

➢ Radiation Oncology Medical Physicist Supply Scenarios
  1. 48 residents entering training annually
  2. 103 residents entering training annually by 2020
  3. 125 residents entering training annually by 2020
  4. 200 residents entering training annually by 2020

➢ Diagnostic Imaging Medical Physicist Supply Scenarios
  1. 7 residents entering training annually
  2. 16 residents entering training annually by 2020
  3. 30 residents entering training annually by 2020
  4. 50 residents entering training annually by 2020
Demand Scenarios

- Radiation Oncology Medical Physicist Demand Scenarios
  1. Cancer incidence grows as projected by NCI
  2. Demand grows at half the rate as would be expected under scenario 1

- Diagnostic Imaging Medical Physicist Demand Scenarios
  1. U.S. population grows as projected by U.S. Census Bureau
  2. Demand grows at half the rate as would be expected under scenario 1
Radiation Oncology Physicists
## Radiation Oncology Physicists Entering Profession and Number Demanded Annually

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply 1</th>
<th>Supply 2</th>
<th>Supply 3</th>
<th>Supply 4</th>
<th>Demand 1</th>
<th>Demand 2</th>
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<td>2014</td>
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<td>2015</td>
<td>153 (35)</td>
<td>147 (41)</td>
<td>144 (44)</td>
<td>154 (34)</td>
<td>179-180</td>
<td>139-140</td>
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<td>2016</td>
<td>118 (70)</td>
<td>121 (67)</td>
<td>122 (66)</td>
<td>126 (62)</td>
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<td>2017</td>
<td>83 (105)</td>
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<td>99 (89)</td>
<td>149 (39)</td>
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<td>152-155</td>
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<tr>
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<td>48 (140)</td>
<td>91 (97)</td>
<td>108 (80)</td>
<td>166 (22)</td>
<td>200-203</td>
<td>153-156</td>
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<tr>
<td>2021</td>
<td>48 (140)</td>
<td>97 (91)</td>
<td>116 (72)</td>
<td>183 (5)</td>
<td>198-191</td>
<td>148-151</td>
</tr>
<tr>
<td>2022</td>
<td>48 (140)</td>
<td>103 (85)</td>
<td>125 (63)</td>
<td>200 (0)</td>
<td>191-192</td>
<td>150-151</td>
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<tr>
<td>2023</td>
<td>48 (140)</td>
<td>103 (85)</td>
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<td>194-200</td>
<td>150-156</td>
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<tr>
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<td>193-217</td>
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</table>
Radiation Oncology Physicists Entering Profession Relative to Demand Annually

The graph shows the number of radiation oncology medical physicists entering the profession relative to the number demanded from 2010 to 2030. The lines represent different residency positions: 200 residencies, 125 residencies, 103 residencies, and 48 residencies.

- The red line indicates a surplus in the early years, reducing to a shortage by 2020.
- The blue line shows a more gradual surplus, peaking in 2020.
- The green line illustrates a steady shortage.
- The black line depicts a fluctuating surplus and shortage balance.

The graph highlights the projected changes in the demand for radiation oncology physicists, indicating a potential shortage in later years unless there are adjustments in residency positions.
Radiation Oncology Physicists Entering Profession Relative to Demand Annually

![Graph showing the number of radiation oncology medical physicists entering the profession relative to number demanded, with excess and shortage projections from 2010 to 2030.]

- 200 Residency Positions
- 125 Residency Positions
- 103 Residency Positions
- 48 Residency Positions

Excess

Shortage
Radiation Oncology Physicist Supply and Demand
Radiation Oncology Physicist Supply Relative to Demand 1

- Excess
- Shortage

Total Number of Radiation Oncology Medical Physicists Relative to Total Number Demanded

- 200 Residency Positions
- 125 Residency Positions
- 103 Residency Positions
- 48 Residency Positions

Years: 2010, 2015, 2020, 2025, 2030
Radiation Oncology Physicist Supply Relative to Demand 2
Diagnostic Imaging Physicists
## Diagnostic Imaging Physicists Entering Profession and Number Demanded Annually

<table>
<thead>
<tr>
<th>Year</th>
<th>Supply 1</th>
<th>Supply 2</th>
<th>Supply 3</th>
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<td>2010</td>
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<td>2016</td>
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<td>2020</td>
<td>7 (17)</td>
<td>14 (10)</td>
<td>25 (0)</td>
<td>40 (0)</td>
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<td>25-26</td>
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<td>45 (0)</td>
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<td>25-26</td>
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<td>27-34</td>
<td>22-30</td>
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</tbody>
</table>
Diagnostic Imaging Physicists Entering Profession Relative to Demand Annually 1

Excess

Number of Diagnostic Imaging Medical Physicians Entering Profession Relative to Number Demanded

Shortage

50 Residency Positions
30 Residency Positions
16 Residency Positions
7 Residency Positions

2010 2015 2020 2025 2030
Diagnostic Imaging Physicists Entering Profession Relative to Demand Annually

Excess

Shortage

-30  -20  -10    0   10   20   30

2010  2015  2020  2025  2030

50 Residency Positions
30 Residency Positions
16 Residency Positions
7 Residency Positions
Diagnostic Imaging Physicist Supply and Demand
Diagnostic Imaging Physicist Supply Relative to Demand 1

Excess

Shortage

Total Number of Diagnostic Imaging Medical Physicists Relative to Total Number Demanded

-50 Residency Positions
-30 Residency Positions
-16 Residency Positions
-7 Residency Positions

2010 2015 2020 2025 2030
Diagnostic Imaging Physicist Supply Relative to Demand 2

Excess

Total Number of Diagnostic Imaging Medical Physicists Relative to Total Number Demanded

50 Residency Positions

30 Residency Positions

16 Residency Positions

7 Residency Positions

Shortage

2010 2015 2020 2025 2030
Conclusions and Key Questions

- Today’s context and the future of the medical physicist workforce
- Basic model specifications
- Supply and demand scenarios
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Conclusions and Key Questions

- The number of new medical physicists needed annually:
  - Diagnostic Imaging: 40 (2010) to 27-34 (2030)

- Without the expansion of clinical residency positions, the production of new medical physicists will not meet those numbers.

- Will employers hire non-certified/non-eligible medical physicists?

- What will become of the non-certified/non-eligible pool?

- How will prospective medical physics students react?

- How will medical physics graduate programs react?
Thank You

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