Internal Medicine Residency Scheduling at the University of Illinois, Urbana-Champaign College of Medicine

David R. Morrison
J. Taylor Fairbank
Sheldon H. Jacobson
Janet A. Jokela, MD

University of Illinois, Urbana-Champaign
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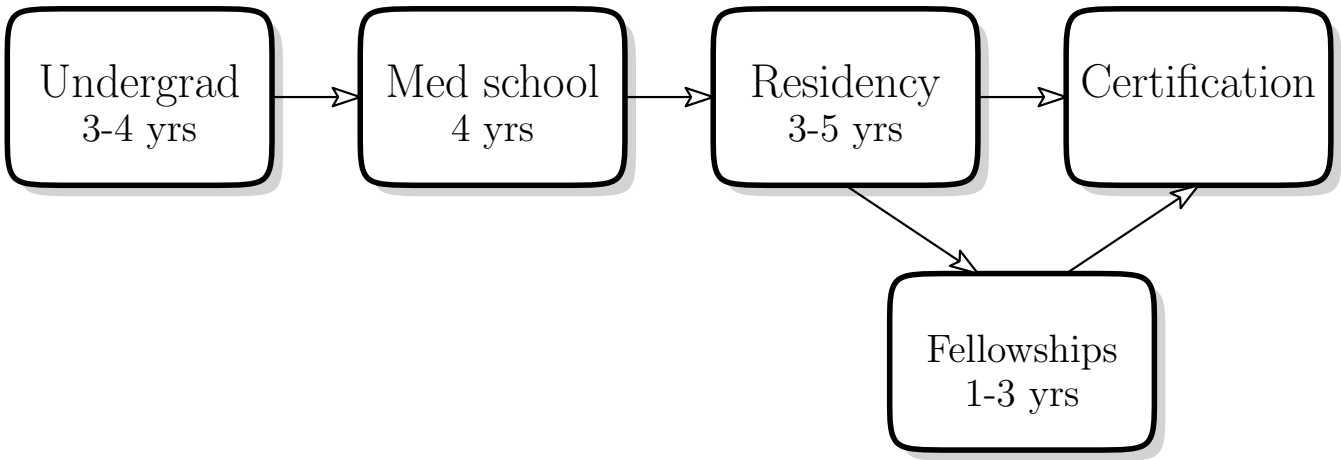
Graduate Medical Education in the US

The training path for physicians:



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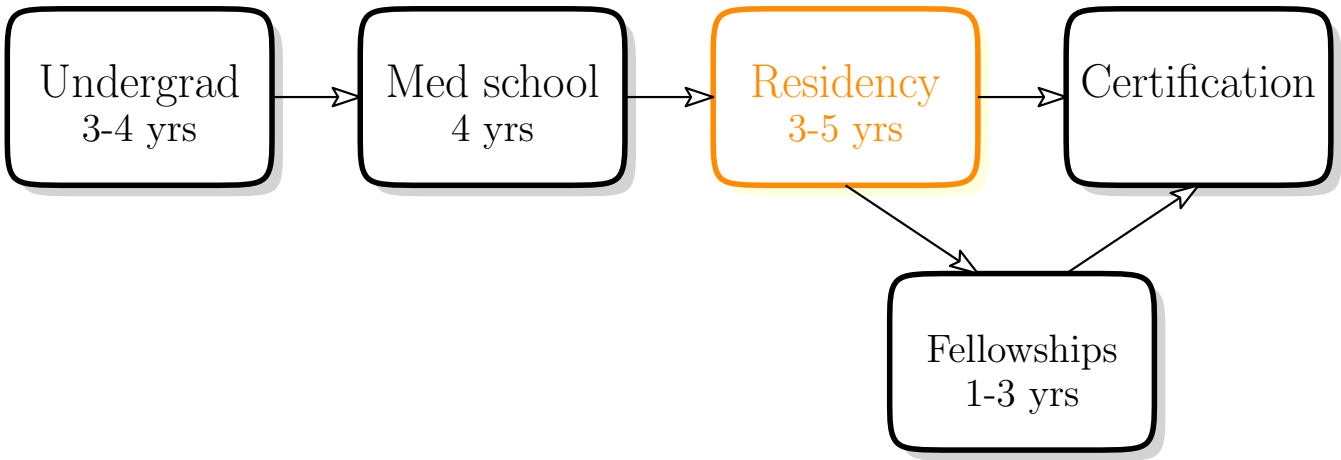
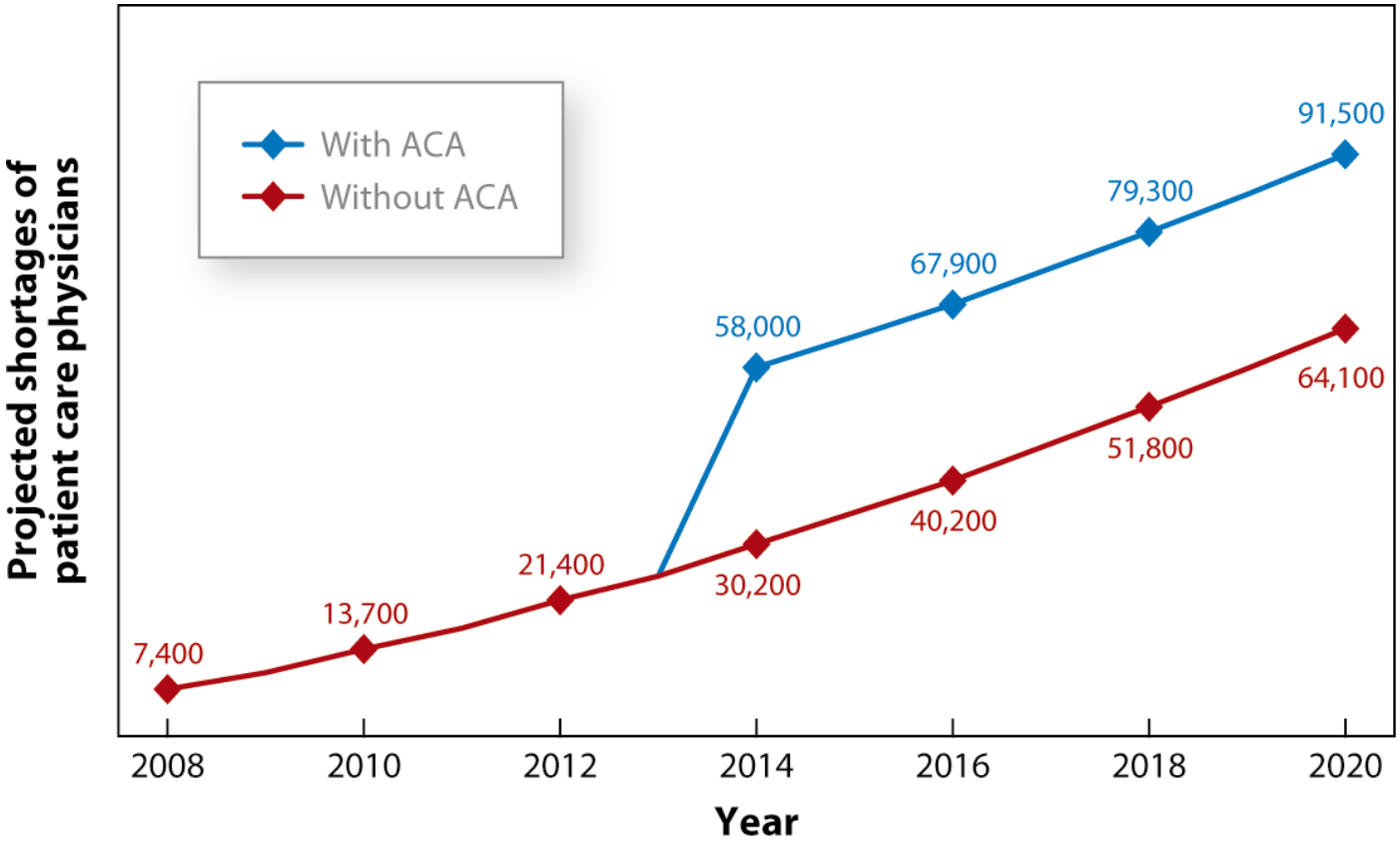


There is an increasing need for trained physicians



Kirch DG, et al. 2012.
Annu. Rev. Med. 63:435–45

There is continuing growth in medical education enrollment

Medical schools have increased enrollment by 30% over 2002 levels.

Source: AAMC Physician Workforce Policy Recommendations, 2012

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There is continuing growth in medical education enrollment

Medical schools have increased enrollment by 30% over 2002 levels.

Residency programs have only increased enrollment by 8% over 2002 levels.

Source: AAMC Physician Workforce Policy Recommendations, 2012

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Residency programs have many obstacles inhibiting growth

The Residency Scheduling Problem

How should residents be assigned to rotations to ensure that they receive the necessary breadth of experience while simultaneously satisfying hospital staffing and coverage requirements?

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The Residency Scheduling Problem

How should residents be assigned to rotations to ensure that they receive the necessary breadth of experience while simultaneously satisfying hospital staffing and coverage requirements?

This problem is solved manually at nearly every residency program in the nation.

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Operations research techniques can make residency programs more efficient

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OR can make residency programs more efficient

A 3-index integer program formulation is used to model RSP:

$$\text{minimize } z = f(\mathbf{x})$$

$$\text{subject to } \sum_{i \in \mathcal{R}} x_{i,j,k} \geq H(j,k) \qquad \forall\, j \in \mathcal{T}, k \in \mathcal{P} \qquad (1.a)$$

$$\sum_{k \in \mathcal{P}} x_{i,j,k} \geq E(i,j) \qquad \forall\, i \in \mathcal{R}, j \in \mathcal{T} \qquad (1.b)$$

$$\sum_{j \in \mathcal{T}} x_{i,j,k} = 1 \qquad \forall\, i \in \mathcal{R}, k \in \mathcal{P} \qquad (1.c)$$

$$x_{i,j,k} \in \{0,1\} \qquad \forall\, i \in \mathcal{R}, j \in \mathcal{T}, k \in \mathcal{P}$$

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The RESIDENT solution

The REsidency Scheduling Interactive DEsigN Tool (RESIDENT) was developed to solve RSP.

- Uses a web-based front-end to input constraints and connect to CPLEX
- Allows program faculty to input additional side constraints
- Currently in alpha testing at UIUC-COM

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Future Directions for the RESIDENT tool

1. Generate day-to-day schedule
2. Multiple-year constraints
3. Integrate user management controls
4. Testing at other residency programs

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Thank you!

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