

**Author Contributions:** Dr Kronish had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

*Study concept and design:* Kronish, Edmondson.

*Acquisition of data:* Kronish.

*Analysis and interpretation of data:* All authors.

*Drafting of the manuscript:* Kronish, Lin, Edmondson.

*Critical revision of the manuscript for important intellectual content:* All authors.

*Statistical analysis:* Kronish, Edmondson.

*Obtained funding:* Kronish.

*Study supervision:* Voils.

**Conflict of Interest Disclosures:** None reported.

**Funding Support:** This study was supported by grants K23 HL098359 from the National Heart, Lung, and Blood Institute (NHLBI) and by 10SDG2600321 from the American Heart Association. Dr Lin received support from grant K07 CA166462 from the National Cancer Institute; Dr Cohen received support from grant K23 HL094765 from the NHLBI; and Dr Edmondson received support from grant R01 HL117832 from the NHLBI. Drs Cohen and Voils were additionally supported by resources from the Department of Veterans Affairs.

**Role of the Sponsors:** The sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, and approval of the manuscript; and decision to submit the manuscript for publication.

**Disclaimer:** The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs nor of the other sponsors of the study.

1. Liebschutz J, Saitz R, Brower V, et al. PTSD in urban primary care: high prevalence and low physician recognition. *J Gen Intern Med.* 2007;22(6):719-726.
2. Edmondson D, Cohen BE. Posttraumatic stress disorder and cardiovascular disease. *Prog Cardiovasc Dis.* 2013;55(6):548-556.
3. Kronish IM, Edmondson D, Li Y, Cohen BE. Post-traumatic stress disorder and medication adherence: results from the Mind Your Heart study. *J Psychiatr Res.* 2012;46(12):1595-1599.
4. Frueh BC, Hamner MB, Cahill SP, Gold PB, Hamlin KL. Apparent symptom overreporting in combat veterans evaluated for PTSD. *Clin Psychol Rev.* 2000;20(7):853-885.
5. Freedy JR, Steenkamp MM, Magruder KM, et al. Post-traumatic stress disorder screening test performance in civilian primary care. *Fam Pract.* 2010;27(6):615-624.
6. Ho PM, Bryson CL, Rumsfeld JS. Medication adherence: its importance in cardiovascular outcomes. *Circulation.* 2009;119(23):3028-3035.

## Teaching Residents to Provide Cost-Conscious Care: A National Survey of Residency Program Directors

Health care costs continue to rise, now accounting for nearly \$3 trillion annually. Evidence shows that physicians who recently completed residency training practice medicine at a higher cost than more experienced physicians.<sup>1</sup> To address this issue, the Medicare Payment and Advisory Commission recommended nearly \$3.5 billion in funding for graduate medical education (GME) be reallocated to programs with curricula that train residents to practice high-value, cost-conscious care.<sup>2</sup>

The objective of this study was to evaluate the state of cost-conscious care education among internal medicine residency programs in the United States.

**Methods** | In August 2012, the Association of Program Directors in Internal Medicine (APDIM) electronically surveyed its membership on the state of cost-conscious care curricula as part of an annual survey of residency program directors.<sup>3</sup>

Survey items evaluated presence of cost-conscious curricula, teaching and assessment methods, and perceptions of medical education's role in teaching cost-conscious care. Nonresponders received weekly e-mail reminders, and the survey was closed in November 2012. The Mayo Clinic Institutional Review Board (IRB) approved this study. Participant consent was waived by the IRB, and survey responders were informed that their responses could be used for research purposes.

Survey responses were appended with publically available data including geographic locations from the Census Bureau, program characteristics from the American Medical Association Fellowship and Residency Electronic Interactive Database Access System, program-specific 3-year rolling pass rates for certification examinations from the American Board of Internal Medicine, and institutional characteristics from the Accreditation Council for Graduate Medical Education.

Multiple logistic regression models were used to test the association between program characteristics and presence of a formal cost-conscious curriculum. Fisher exact tests were used to compare teaching and assessment methods used by programs. Statistical analysis was conducted using STATA (version 12) (StataCorp).

**Results** | Among the 370 programs, 295 (79.7%) responded to the APDIM survey and 261 (70.5%) completed the cost-conscious care questionnaire. Among respondents, 14.9% indicated they had a formal curriculum in cost-conscious care, while 49.8% stated they did not but were working on it. Among programs with a formal curriculum, the most common teaching methods were didactic teaching (97.4%), followed by informal discussion (76.9%), and the most frequent method of resident assessment was by faculty (41.0%), followed by no assessment (38.5%). Among all programs, 84.9% agreed that GME has a responsibility to curtail the rising cost of health care. However, only 47.5% agreed that the majority of their faculty consistently role modeled cost-conscious care, and only 33.2% agreed that residents had access to information on costs of tests and procedures they order.

Programs that were in the West (odds ratio [OR], 6.61;  $P = .004$ ), university based (OR, 3.33;  $P = .03$ ), and had more residency positions (36-53 positions vs  $\leq 35$  positions, OR, 6.1;  $P = .04$ ) had a higher odds of having a cost-conscious care curriculum (Table 1). Programs with a curriculum were more likely to use didactic sessions, medical chart reviews, web-based learning, and independent reading materials (Table 2).

**Discussion** | Despite the national consensus among policy makers and educators on medical education's role in cost-conscious care,<sup>2,4</sup> less than 15% of programs had a formal curriculum, while approximately 50% of programs were working on one. Use of robust teaching and assessment methods linked to practice change was limited. While faculty were the most frequently reported evaluator of resident competence in cost-conscious care, many program directors

Table 1. Odds of Having a Formal Curriculum in Cost-Conscious Care, Adjusted for Program Characteristics

Program Characteristic	No. (%)	OR (95% CI)	P Value
Census region			
Northeast	85 (32.6)	1 [Reference]	
South	72 (27.6)	2.84 (0.96-8.40)	.06
Midwest	61 (23.4)	2.44 (0.80-7.41)	.12
West	40 (15.3)	6.61 (1.82-23.96)	.004
Other <sup>a</sup>	3 (1.1)		
Program type			
Community based, university affiliated	137 (52.5)	1 [Reference]	
University based	98 (37.5)	3.33 (1.10-10.06)	.03
Community based	21 (8.0)	1.3 (0.29-5.87)	.73
Military based <sup>a</sup>	5 (1.9)		
Government affiliation			
No	190 (72.8)	1 [Reference]	
Yes	71 (27.2)	0.75 (0.28-2.00)	.57
ABIM passing rate, %			
≥95	44 (16.9)	1 [Reference]	
90-94	62 (23.8)	2.22 (0.60-8.15)	.23
80-89	92 (35.2)	1.72 (0.51-5.84)	.39
0-79	56 (21.5)	1.73 (0.44-6.84)	.44
Unknown	7 (2.7)	2.25 (0.17-29.61)	.54
International medical graduates, %			
≥90	55 (21.1)	1.83 (0.44-7.55)	.40
50-<90	61 (23.4)	1.91 (0.56-6.48)	.30
5-<50	70 (26.8)	0.69 (0.23-2.07)	.51
<5	63 (24.1)	1 [Reference]	
Unknown	12 (4.6)	3.6 (0.59-22.00)	.17
ACMGE approved positions			
≥85	78 (29.9)	6.53 (0.95-44.61)	.06
54-84	62 (23.8)	4.85 (0.84-27.96)	.08
36-53	71 (27.2)	6.10 (1.13-32.93)	.04
≤35	50 (19.2)	1 [Reference]	
No. of hospital beds			
>900	51 (19.5)	1 [Reference]	
601-900	47 (18.0)	0.82 (0.22-2.99)	.76
301-600	88 (33.7)	1.68 (0.54-5.27)	.37
≤300	34 (13.0)	0.5 (0.07-3.41)	.48
Unknown	41 (15.7)	1.04 (0.30-3.60)	.96
Presence of volunteer faculty			
Yes	171 (65.5)	1.51 (0.59-3.87)	.39
No	64 (24.5)	1 [Reference]	
Unknown	26 (10.0)	1.48 (0.37-5.89)	.58

Abbreviations: ABIM indicates American Board of Internal Medicine; ACMGE, Accreditation Council for Graduate Medical Education; OR, odds ratio.

<sup>a</sup> Omitted owing to collinearity from small sample size.

believed that their faculty did not consistently role model cost-conscious behavior.

Several models for training residents in high-value, cost-conscious care have been proposed.<sup>5,6</sup> If GME is going to play a significant role in curtailing the rising cost of health care, it must leverage such models to develop more robust teaching and assessment methods and provide faculty development. Programs that have already implemented such curricula should rigorously study its impact on resident and faculty behavior to inform adoption at other institutions.

**Mitesh S. Patel, MD, MBA**  
**Darcy A. Reed, MD, MPH**  
**Laura Loertscher, MD**  
**Furman S. McDonald, MD, MPH**  
**Vineet M. Arora, MD, MAPP**

**Author Affiliations:** Philadelphia VA Medical Center, Philadelphia, Pennsylvania (Patel); Robert Wood Johnson Clinical Scholars Program, University of Pennsylvania, Philadelphia (Patel); Division of Primary Care Internal Medicine, Mayo Clinic, Rochester, Minnesota (Reed); General Internal Medicine, Providence St Vincent Medical Center, Portland, Oregon (Loertscher); General

Table 2. Teaching and Assessment Methods Used for Training Residents in Cost-Conscious Care

Domain and Method	Has a Formal Curriculum in Cost-Conscious Care					
	Yes (n=39)		No, Working on It (n=130)		No <sup>a</sup> (n=92)	
	No. (%)	P Value	No. (%)	P Value	No. (%)	
Teaching domain						
Informal discussion, eg, on rounds, in clinic	30 (76.9)	.05	110 (84.6)	.22	83 (90.2)	
Didactic sessions, eg, conferences	38 (97.4)	<.001	90 (69.2)	.001	44 (47.8)	
Dedicated teaching sessions separate from established resident conferences	6 (15.4)	.18	17 (13.1)	.11	6 (6.5)	
Simulation-based education, eg, case scenarios with standardized or simulated patients	6 (15.4)	.06	7 (5.4)	.73	4 (4.3)	
Review of patient medical chart, billing, or orders	17 (43.6)	.01	31 (23.8)	.58	19 (20.7)	
Electronic display of cost information at the point of care	4 (10.3)	.45	11 (8.5)	.39	5 (5.4)	
Web-based learning	13 (33.3)	<.01	20 (15.4)	.22	9 (9.8)	
Independent reading materials	10 (25.6)	<.001	29 (22.3)	<.001	3 (3.3)	
None	0	NA	6 (4.6)	.04	0	
Other/unanswered	2 (5.1)	.72	12 (9.2)	.67	7 (7.6)	
Assessment domain						
None	15 (38.5)	.05	71 (54.6)	.66	53 (57.6)	
Supervising faculty assessment	16 (41.0)	.66	55 (42.3)	.42	34 (37.0)	
Peer assessment	5 (12.8)	.61	13 (10.0)	.96	9 (9.8)	
Resident self-assessment	9 (23.1)	.03	24 (18.5)	.04	8 (8.7)	
Performance assessment using chart audit	4 (10.3)	.92	19 (14.6)	.42	10 (10.9)	
Structured direct observation of skills, eg, OSCE, CEX	4 (10.3)	.92	13 (10.0)	.83	10 (10.9)	
Written knowledge test	2 (5.1)	.16	5 (3.8)	.21	1 (1.1)	
Attitudinal survey	4 (10.3)	.04	2 (1.5)	.73	2 (2.2)	
Other/unanswered	4 (10.3)	.002	3 (2.3)	.14	0	

Abbreviations: CEX, clinical evaluation exercise; NA, not applicable; OSCE, objective structured clinical examination.

<sup>a</sup> Referent variable for  $\chi^2$  statistic.

and Hospital Internal Medicine, Mayo Clinic, Rochester, Minnesota (McDonald); Section of General Internal Medicine, University of Chicago, Chicago, Illinois (Arora).

**Corresponding Author:** Mitesh S. Patel, MD, MBA, VA/Robert Wood Johnson Clinical Scholars Program, University of Pennsylvania, 423 Guardian Dr, 1303B Blockley Hall, Philadelphia, PA 19104 (mpatel@upenn.edu).

**Published Online:** December 16, 2013.  
doi:10.1001/jamainternmed.2013.13222.

**Author Contributions:** Dr Patel had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Study concept and design:** Patel, Reed, Loertscher, McDonald, Arora.

**Acquisition of data:** Patel, Reed, McDonald, Arora.

**Analysis and interpretation of data:** Patel, McDonald, Arora.

**Drafting of the manuscript:** Patel.

**Critical revision of the manuscript for important intellectual content:** Patel, Reed, Loertscher, McDonald, Arora.

**Statistical analysis:** Patel.

**Obtained funding:** McDonald, Arora.

**Administrative, technical, or material support:** Patel, McDonald, Arora.

**Study supervision:** Patel, Arora.

**Conflict of Interest Disclosures:** None reported.

**Disclaimer:** While we are reporting the results of the APDIM Survey Committee, we are not presuming to speak for the organization, and our Research Letter does not constitute an official policy statement of APDIM, the APDIM Council, or any other organization with which any of the authors may be affiliated.

**Additional Contributions:** We are grateful for the support of APDIM, the members of the Survey Committee, and the residency Program Directors who completed the APDIM survey. We are grateful to the Mayo Clinic Survey Research Center for assistance with the survey design and data collection.

**Correction:** This article was corrected on December 26, 2013, to fix a percentage given in the Results section.

- Mehrotra A, Reid RO, Adams JL, Friedberg MW, McGlynn EA, Hussey PS. Physicians with the least experience have higher cost profiles than do physicians with the most experience. *Health Aff (Millwood)*. 2012;31(11):2453-2463.
- Hackbarth G, Boccuti C. Transforming graduate medical education to improve health care value. *N Engl J Med*. 2011;364(8):693-695.
- Chaudhry SI, Khanijo S, Halvorsen AJ, McDonald FS, Patel K. Accountability and transparency in graduate medical education expenditures. *Am J Med*. 2012;125(5):517-522.
- Cooke M. Cost consciousness in patient care—what is medical education's responsibility? *N Engl J Med*. 2010;362(14):1253-1255.
- Smith CD; Alliance for Academic Internal Medicine—American College of Physicians High Value; Cost-Conscious Care Curriculum Development Committee. Teaching high-value, cost-conscious care to residents: the Alliance for Academic Internal Medicine—American College of Physicians curriculum. *Ann Intern Med*. 2012;157(4):284-286.
- Patel MS, Davis MM, Lyson ML. The VALUE Framework: training residents to provide value-based care for their patients. *J Gen Intern Med*. 2012;27(9):1210-1214.