Teaching High-Value Care in Pediatrics: A National Survey of Current Practices and Guide for Future Curriculum Development

Michael J. Tchou, MD
Alice Walz, MD
Elizabeth Burgener, MD
Alan Schroeder, MD
Rebecca Blankenburg, MD, MPH

ABSTRACT

Background Health care expenditures in the United States are increasing at an unsustainable pace. There have been calls to incorporate education on resource stewardship into medical training, yet the perceived need for and current use of high-value care (HVC) curricula in pediatrics residency programs is unknown.

Objective We described the current national landscape of HVC curricula in pediatrics residencies, including characterization of current programs, barriers to the practice of HVC, and clarification of preferred curricula types.

Methods Using a cross-sectional study design, we conducted a national, anonymous, web-based survey of pediatrics residency program directors and pediatrics chief residents in fall 2014.

Results We received responses from 85 of 199 (43%) pediatrics program directors and 74 of 199 (37%) pediatrics chief residents. Only 10% (8 of 80) of program directors and 12% (8 of 65) of chief residents reported having a formal curriculum on HVC. Respondents identified the largest barriers to HVC as a lack of cost transparency (program directors) and attending physicians having the final say in treatment decisions (chief residents). The majority of respondents (83%, 121 of 146) agreed their program needs a HVC curriculum, and 90% (131 of 145) reported they would use a curriculum if it was available. Respondents significantly preferred a case-based conference discussion format over other approaches.

Conclusions Most pediatrics residency programs responding to a survey lacked formal HVC curricula. There is a desire nationally for HVC education in pediatrics, particularly in a case-based discussion format.

Introduction

Health care spending in the United States has increased dramatically, and now makes up 17% of the gross domestic product.[1] Despite these expenditures, the United States has poorer health care outcomes than most other developed nations.[2] This fact, along with questions around overdiagnosis[3] and overtreatment,[4] has driven national conversations on how to reduce waste and improve value through practicing high-value care (HVC).[5] In pediatrics, generally considered a low-cost specialty, the United States has higher costs and poorer outcomes than peer nations,[6] and these costs are increasing at a rapid rate.[7] Complicating this situation is information showing that physicians have poor knowledge of the cost and value of the care they provide.[8,9] In response to these challenges, there have been several calls to incorporate HVC education into residency training and physicians' ongoing professional development.[10,11] Some physicians have even advocated for advancing HVC as a seventh core competency within the Accreditation Council for Graduate Medical Education's requirements.[12]

In the past decade, we have made progress establishing needed educational resources around HVC with the introduction of journal sections on value,[13,14] the Choosing Wisely campaign,[15] and HVC curricula.[16–19] Despite this increase in resources, there remains a significant gap in uptake. Several national surveys have found low rates of formal HVC education in internal medicine residency programs.[20–23] To date, no studies have focused on the broader landscape of HVC education in pediatrics.

The objective of our study was to describe the current state and future needs of HVC education in pediatrics residency programs. Using a national survey, we characterized the current use of HVC education, barriers to HVC clinical practice, and desired forms of HVC education within pediatrics residencies. With this information, we anticipate the

DOI: http://dx.doi.org/10.4300/JGME-D-17-00139.1

Editor's Note: The online version of this article contains the survey used in the study and a table of barriers to high-value, cost-conscious care.

field can more fully address the pediatrics-specific needs of HVC education.

What was known and gap
Residents need to learn to be stewards of health care resources, yet the use of high-value care (HVC) curricula in pediatrics residency programs is unknown.

What is new
A national survey of pediatrics programs showed high interest in HVC education, yet limited use of formal curricula to date.

Limitations
Potential for sampling bias; survey instrument without validity evidence.

Bottom line
Residents preferred a case-based teaching format. Intensive care unit and emergency department settings may present valuable opportunities for informal teaching in the clinical setting.

Methods

We performed a national, anonymous, web-based cross-sectional survey of pediatrics residency program directors (PDs) and pediatrics chief residents (CRs) to assess the current state of HVC education in US pediatrics residency programs in fall 2014. The authors drafted survey questions that were modeled after previously published surveys on HVC education.[8,9,20,23–25] The survey was revised via expert review from 6 pediatrics faculty with expertise in education, survey design, and HVC. Survey questions were developed to target key drivers in HVC education: knowledge of HVC, current practice, barriers to HVC practice, current education on HVC, and preferences for HVC curricula. In general, 4-point Likert scales were used to evaluate the educational environment for HVC, and verbal frequency scales were used to assess HVC practice. A 10-point numerical Likert scale was used to assess barriers to HVC to increase the power to differentiate the relative importance of barriers. We piloted the survey with 4 faculty, including associate program directors and prior CRs, who were familiar with the residency program's educational activities and not part of the target audience. The final survey consisted of 21 questions (provided as online supplemental material).

The study survey was reviewed and approved by the Stanford University Institutional Review Board and the Association of Pediatric Program Directors (APPD) Research Task Force.

The anonymous, web-based survey hosted in Qualtrics (Qualtrics LLC, Provo, UT) was distributed via the APPD e-mail listservs to PDs and CRs at 199 US pediatrics residency programs. Three follow-up reminder e-mails were sent over a 3-month period. Results were analyzed using SPSS version 17.0 (SPSS Inc, Chicago, IL) to compare demographic subgroups and to compare PD and CR responses. Statistical analysis included Wilcoxon rank sum test, Pearson's chi-square test with and without continuity correction, Fisher's exact test, and Kruskal-Wallis analysis, as appropriate.

Results

Program Demographics

Of the 199 pediatrics residency programs in the United States, we received survey responses from 85 (43%) PDs and 74 (37%) CRs. Of 159 total responses, 15 surveys did not have answers for all required questions. In these surveys, data from incomplete questions were excluded from analysis. Survey respondents encompassed all 4 major US census regions and a range of program sizes, from fewer than 20 to more than 99 pediatrics residents. Approximately half of the responding programs had a combined medicine-pediatrics training program. Responding programs were more often from urban and/or university-affiliated programs. Comparing PD and CR responses to available national program data, both samples differed significantly in program size, location, university or children's hospital affiliation, and presence of combined medicine-pediatrics programs (TABLE 1).

Current State of HVC Curricula

Overall, only 11% of total respondents in our study reported their program had a formal HVC curriculum (PDs: 10%, 8 of 80; CRs: 12%, 8 of 65), and only 23% of respondents indicated residents receive adequate training in the costs of providing care (PDs: 21%, 17 of 80; CRs: 26%, 17 of 66). There was no significant difference in prevalence of programs with cost-conscious care curricula between pediatrics and combined medicine-pediatrics programs (8% versus 14%).

Of the 16 respondents who indicated their program had a formal HVC curriculum, there was a wide range of teaching modalities used, with conference case presentations (81%, 13 of 16) and didactic lectures (63%, 10 of 16) as the most common. Eight programs (50%) used pop-up screens in the electronic health record, and 2 respondents (13%) used computer-based didactic modules, auditing of patient charts with feedback or reflection, or elective rotations. One respondent (6%) had a required rotation.

TABLE 1
Demographics[a]

Characteristics	Overall, %	PDs, %	CRs, %	National Comparison Data, %	*P* Value of Overall Versus National Data
Region					
Northeast	25	27	23	29	.22
South	32	33	31	35	.75
Midwest	29	28	31	22	.027
West	14	13	16	13	.61
Size of program					
< 20	10	12	8	21	.0008
20–39	26	25	26	36	.011
40–59	19	21	17	20	.73
60–79	11	11	11	11	.87
80–99	19	19	19	8	< .0001
> 99	15	12	18	4	< .0001
Combined medicine-pediatrics residents in program	50	51	48	39	.007
Primary location					
Urban	77	76	79		
Suburban	16	16	17		
Rural	7	8	4		
Primary setting					
University or children's hospital based	89	86	93	50	< .0001
Community based	11	15	7	47[b]	< .0001
Other				3	
Primary clinical setting					
Inpatient	46	33	61		
Equal inpatient and outpatient time	48	62	32		
Outpatient	7	6	7		

Abbreviations: PD, program director; CR, chief resident.

[a] Survey respondents' responses to demographic questions about the program they are directing (PDs) or trained in (CRs). National comparison data use Association of Pediatric Program Directors' comparison data for 2016–2017 for region and size of program. National comparison data on combined medicine-pediatric residency programs obtained from American Medical Association FREIDA database (https://www.ama-assn.org/life-career/search-ama-residency-fellowship-database). National comparison data for primary setting obtained from Abramson EL, Naifeh MM, Stevenson MD, et al. Research training among pediatric residency programs: a national assessment. *Acad Med.* 2014;89(12):1674–1680.

[b] Community includes those programs that identified themselves either as a community–university-affiliated program or a community-only program.

In programs with formal HVC curricula, 81% of respondents (13 of 16) agreed that the curricula had changed their personal ordering behavior (PDs: 75%, 6 of 8; CRs: 88%, 7 of 8) and the ordering behavior of physicians in the program (PDs: 88%, 7 of 8; CRs: 75%, 6 of 8).

Seventy-nine percent of respondents (114 of 145) described high rates of informal HVC teaching in the clinical setting. There were significant differences in perceived informal teaching rates among the 4 main clinical areas ($P \leq .001$), with higher rates of informal teaching noted in the inpatient units and outpatient clinics compared to intensive care units (ICUs) and emergency departments (EDs). The majority of PDs and CRs estimated that residents received informal teaching at least once a month. However, PD estimates of the frequency of teaching were significantly higher than those of CRs (TABLE 2).

Current State of HVC Knowledge and Practice

Almost half of respondents indicated a lack of knowledge around the costs of common tests (45%, 66 of 146). Chief residents had a significantly higher perception of knowledge of costs than PDs (64%, 42 of 66 versus 48%, 38 of 80; $P = .016$; TABLE 3). Respondents reported several important barriers to practicing HVC (provided as online supplemental material). Among the 4 barriers included in the survey, limited transparency (median = 7 out of 10-point Likert scale) and residents not having the final say in treatment decisions (median = 7) were perceived as significantly greater barriers ($P \leq .001$) than

TABLE 2
Informal Teaching on High-Value Care[a]

	Respondent	Never, %	Rarely (1×/y), %	Sometimes (1×/mo), %	Frequently (1×/wk), %	PD Versus CR *P* Value
Overall	Overall	1	21	48	31	.004
	CR	1	26	54	18	
	PD	0	16	43	41	
By location						
Acute care ward	Overall	2	15	48	35	.001
	CR	3	23	51	23	
	PD	1	9	45	45	
Outpatient clinic	Overall	4	19	50	28	< .001
	CR	6	32	49	12	
	PD	1	9	50	40	
ED	Overall	11	37	37	15	< .001
	CR	19	45	29	7	
	PD	5	31	44	20	
ICU	Overall	15	33	41	11	.001
	CR	26	35	31	8	
	PD	6	31	49	14	

Abbreviations: PD, program director; CR, chief resident; ED, emergency department; ICU, intensive care unit.
[a] Perception of informal teaching and discussions of high-value care medicine at respondents' institution. Overall responses graded by frequency of teaching. Respondents also estimated frequency of teaching in various practice settings. Comparisons between program directors and chief residents made via Wilcoxon rank sum analysis, and comparisons between locations made via Kruskal-Wallis and Wilcoxon rank sum analysis.

residents having limited knowledge of alternatives to current practice (median = 6). Patients being too sick to use a stepwise approach (median = 3) was seen as a significantly lower barrier ($P \leq .001$). In general, PDs and CRs agreed on their ranking of these barriers. Limited transparency of cost was perceived as a higher barrier to HVC by PDs (CR: median = 6; PD: median = 7.5; $P = .004$).

TABLE 3
Current Knowledge and Practice of High-Value Care[a]

Survey Questions	Respondent	Strongly Agree, %	Agree, %	Disagree, %	Strongly Disagree, %	*P* Value Comparing PD/CR
I have knowledge of the costs of common tests and treatments that I offer	Overall	12	43	39	6	.016
	CR	20	44	30	6	
	PD	5	43	46	6	
My program orders fewer tests per patient than the average at other pediatrics residency programs	Overall	1	32	63	4	.98
	CR	0	35	59	6	
	PD	3	29	66	3	
The cost of care per patient at our primary hospital is less than the average cost at other pediatrics programs	Overall	3	30	66	2	.67
	CR	5	26	67	3	
	PD	1	33	65	1	
Patients at our primary hospital are more complex than the average patient at other pediatrics residency program	Overall	23	44	33	1	.69
	CR	20	52	29	0	
	PD	25	38	36	1	
Residents at my program receive adequate training in the cost of care that they provide	Overall	3	21	62	15	.99
	CR	5	21	56	18	
	PD	1	20	66	13	

Abbreviations: PD, program director; CR, chief resident.
[a] Comparison of pediatrics residency program directors' and chief residents' perception of their knowledge of cost and several high-value care practices at their institution. Program directors and chief residents were compared using Wilcoxon rank sum analysis.

TABLE 4
Desired Types of Curriculum in High-Value Care[a]

Curriculum Type	Overall, %	PD, %	CR, %	*P* Value Comparing PD/CR
Case presentations at conference	77	78	75	.92
Computer-based didactic modules	51	63	37	.002
Computer-based case simulation	42	54	28	.003
Pop-up screens in electronic health record	46	46	46	> .99
Auditing of patient charts with feedback or reflection	40	39	42	.87
Didactic lectures	39	33	46	.13
Elective rotations	15	15	14	> .99
Required rotations	3	0	6	.038[b]
Other	1	1	0	> .99[b]

Abbreviations: PD, program director; CR, chief resident.
[a] Types of curriculum survey respondents would like in a high-value care curriculum, stratified into program director and chief resident responses. Comparison made using chi-square with continuity correction.
[b] Fisher's exact test used for those comparisons with low-expected counts less than 5.

Perceived Needs in HVC Curricula

Overall, 83% of respondents (121 of 146) indicated their program needs a formal curriculum on HVC, and 90% (131 of 145) would be interested in such a curriculum, if it were available. The most highly desired teaching modality was interactive case presentations at conferences. Program directors also rated computer-based didactic modules and computer case-based simulations highly, but these were among the least desired modalities by CRs (TABLE 4).

Discussion

A national cross-sectional survey confirmed a lack of formal education around the topic of HVC in pediatrics programs. The data point to a wide gap between what PDs perceive is frequent informal training on HVC and what CRs observe as less frequent training, especially in the ICU and ED settings. By quantifying some of the current challenges in pediatric HVC education, our survey highlights opportunities for future educational interventions.

Universally, there is a desire for HVC curricula, with both PDs and CRs strongly supporting an in-person, conference-based case discussion format. If programs and educators can design and implement curricula that address this desire, there may be strong uptake. In addition, our study indicated that ICUs and EDs may be particularly high-yield opportunities for targeting education, as diagnostic testing and intervention frequently occur in these places, while our survey indicated less informal HVC education is taking place.

Finally, our survey supports the fact that targeting faculty- and attending-level providers for HVC education efforts may be important in addition to cost transparency, as both were identified as key barriers to performing HVC. There has already been a successful effort in pediatrics to train attending-level providers on cost,[26] and spreading this effort to other areas may yield positive results. Institutions that only target trainees for HVC education risk creating conflict between this formal curriculum and the informal or "hidden" curricula we often see in clinical care. Given that trainees often simulate their attending physicians' clinical practice,[20,27] a multifaceted approach to HVC education that includes faculty may yield better results.

Our study has limitations. The data are self-reported, and respondents' perceptions may differ from actual clinical and educational practice. We used a survey instrument with expert review, but no further evidence of validity, and respondents may have interpreted questions differently from intended. There may be selection bias, as programs with curricula or those that see HVC as an area of need may be more likely to respond. In addition, there was more representation from larger programs, university-based programs, Midwest-based programs, and programs with medicine-pediatrics training compared with the national cohort of pediatrics programs. Finally, the survey design had few free-text response options, limiting participants' ability to communicate nuances, such as the reasons formal curricula have not yet been implemented. Follow-up qualitative studies are recommended to further explore the barriers to curricula implementation given residencies' high desire for HVC curricula.

While HVC education is the first step, we need to ensure that it is effective. Currently, approximately half of programs do not evaluate residents' knowledge of HVC. As HVC is embraced as a competency, systems will need to be in place to evaluate residents

and track their progress toward mastery of the concept,[28] including potential milestones assessing resident HVC abilities.

Conclusion

While the majority of pediatrics residency programs do not currently have a formal HVC curriculum, there is a desire nationally for HVC curricula in pediatrics, particularly in a case-based discussion format. Additional opportunities exist to teach HVC in the ICU and ED through informal teaching in the clinical setting.

References

1. Organization for Economic Cooperation and Development. OECD health statistics 2017. http://www.oecd.org/health/health-data.htm. Accessed September 20, 2017.
2. The Commonwealth Fund. Health system scorecards. http://www.commonwealthfund.org/publications/health-system-scorecards. Accessed September 20, 2017.
3. Coon ER, Quinonez RA, Moyer VA, et al. Overdiagnosis: how our compulsion for diagnosis may be harming children. *Pediatrics*. 2014;134(5):1013–1023.
4. Coon ER, Young PC, Quinonez RA, et al. Update on pediatric overuse. *Pediatrics*. 2017;139(2):pii:e20162797.
5. Berwick DM, Hackbarth AD. Eliminating waste in US health care. *JAMA*. 2012;307(14):1513–1516.
6. Fairbrother G, Guttman A, Klein JD, et al. Higher cost, but poorer outcomes: the US health disadvantage and implications for pediatrics. *Pediatrics*. 2015;135(6):961–964.
7. Bui AL, Dieleman JL, Hamavid H, et al. Spending on children's personal health care in the United States, 1996-2013. *JAMA Pediatr.* 2017;171(2):181–189.
8. Rock TA, Xiao R, Fieldston E. General pediatric attending physicians' and residents' knowledge of inpatient hospital finances. *Pediatrics*. 2013;131(6):1072–1080.
9. Tek Sehgal R, Gorman P. Internal medicine physicians' knowledge of health care charges. *J Grad Med Educ*. 2011;3(2):182–187.
10. Korenstein D. Charting the route to high-value care: the role of medical education. *JAMA*. 2015;314(22):2359–2361.
11. Moriates C, Dohan D, Spetz J, et al. Defining competencies for education in health care value: recommendations from the University of California, San Francisco Center for Healthcare Value Training Initiative. *Acad Med*. 2015;90(4):421–424.
12. Weinberger SE. Providing high-value, cost-conscious care: a critical seventh general competency for physicians. *Ann Intern Med*. 2011;155(6):386–388.
13. Fieldston E, Marar M, Jonas J. Bending the value curve. *Hosp Pediatr.* 2014;4(4):261–263.
14. Feldman LS. Choosing Wisely(®): things we do for no reason. *J Hosp Med*. 2015;10(10):696.
15. ABIM Foundation. Choosing Wisely. 2017. http://www.choosingwisely.org. Accessed September 20, 2017.
16. American College of Physicians. High value care pediatric cases. https://www.acponline.org/clinical-information/high-value-care/resources-for-clinicians/high-value-care-pediatric-cases. Accessed September 20, 2017.
17. Woods S, Avery C, Bartlett K, et al. High value care pediatric curriculum. *MedEdPortal Publ*. 2015;11:10146.
18. Blackwell M, Moore K, Kocoloski A, et al. Teaching and evaluating high-value care through a novel case-based morning report. *MedEdPortal Publ*. 2016;12:10356.
19. Moriates C, Mourad M, Novelero M, et al. Development of a hospital-based program focused on improving healthcare value: hospital high-value care program. *J Hosp Med*. 2014;9(10):671–677.
20. Patel MS, Reed DA, Loertscher L, et al. Teaching residents to provide cost-conscious care: a national survey of residency program directors. *JAMA Intern Med*. 2014;174(3):470–472.
21. Ryskina KL, Smith CD, Weissman A, et al. US internal medicine residents' knowledge and practice of high-value care: a national survey. *Acad Med*. 2015;90(10):1373–1379.
22. Korenstein D, Weissman A, Smith CD. Trends in high-value care as reported by internal medicine program directors. *J Grad Med Educ*. 2016;8(3):426–428.
23. Varkey P, Murad MH, Braun C, et al. A review of cost-effectiveness, cost-containment and economics curricula in graduate medical education: teaching cost-effectiveness. *J Eval Clin Pract*. 2010;16(6):1055–1062.
24. Lee JA, Chernick L, Sawaya R, et al. Evaluating cost awareness education in US pediatric emergency medicine fellowships. *Pediatr Emerg Care*. 2012;28(7):655–675.
25. Sommers BD, Desai N, Fiskio J, et al. An educational intervention to improve cost-effective care among medicine housestaff: a randomized controlled trial. *Acad Med*. 2012;87(6):719–728.
26. Jonas JA, Ronan JC, Petrie I, et al. Description and evaluation of an educational intervention on health care costs and value. *Hosp Pediatr.* 2016;6(2):72–79.
27. Sedrak MS, Patel MS, Ziemba JB, et al. Residents' self-report on why they order perceived unnecessary

inpatient laboratory tests: why residents order unnecessary inpatient laboratory tests. *J Hosp Med*. 2016;11(12):869–872.

28. Liao JM, Wachter RM. Grading residents' clinical performance: unique opportunities and challenges. *J Gen Intern Med*. 2014;29(7):983–985.

Michael J. Tchou, MD, is Pediatric Hospital Medicine Fellow, Division of Hospital Medicine, Department of Pediatrics, Cincinnati Children's Hospital Medical Center; **Alice Walz, MD,** is Pediatric Critical Care Fellow, Division of Critical Care Medicine, Department of Pediatrics, Vanderbilt University School of Medicine; **Elizabeth Burgener, MD,** is Pediatric Pulmonology Fellow, Division of Pulmonology, Department of Pediatrics, Stanford School of Medicine; **Alan Schroeder, MD,** is Clinical Associate Professor, Division of Pediatric Hospital Medicine, Department of Pediatrics, Stanford School of Medicine; and **Rebecca Blankenburg, MD, MPH,** is Clinical Associate Professor, Division of Pediatric Hospital Medicine, Department of Pediatrics, Stanford School of Medicine.

Funding: The authors report no external funding source for this study.

Conflict of interest: The authors declare they have no competing interests.

These results were presented as an abstract: Tchou M, Burgener E, Hensley A, et al. Teaching residents to provide high-value care: evaluation of cost-conscious care curricula in pediatric residencies. *Acad Pediatr*. 2015;15(4):e9. doi:doi:10.1016/j.acap.2015.04.027.

The authors would like to thank the Association of Pediatric Program Directors for its assistance with survey distribution.

Corresponding author: Michael J. Tchou, MD, Cincinnati Children's Hospital Medical Center, MLC 9016, 3333 Burnet Avenue, Cincinnati, OH 45229, 603.340.3709, fax 888.984.9326, michael.tchou@cchmc.org

Received February 21, 2017; revision received June 27, 2017; accepted August 7, 2017.