



Developing the PedsValue Modules—A National Pediatric High Value Care Curriculum

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IN RESPONSE TO a critical need for health care value education for pediatric residents and practicing physicians, a team of academic pediatricians collaborated across institutions to create an online case-based pediatric value curriculum according to a widely used medical education curriculum development framework (Table 1).¹ In this article we present a qualitative description of the development process of this curriculum.

STEP 1: PROBLEM IDENTIFICATION AND GENERAL NEEDS ASSESSMENT

The United States spent 17.8% of its gross domestic product on health care in 2015.⁴ Despite spending twice as much on health care per child compared with other industrialized nations,⁵ the United States consistently performs poorly on critical child health outcomes such as infant mortality, child poverty, and immunization rates.^{6,7} Improving health care value (defined as quality/cost)⁸ has become a national priority. Although there is a deficit of measurable and meaningful pediatric value metrics,⁹ one burgeoning attempt to study such value indicators shows that children in the ambulatory setting in the United States receive only 46.5% of indicated care.¹⁰ Such suboptimal returns on our health care investment results in mounting concerns over wasteful spending and low value care.

Over the past 15 years, US health care spending per capita has grown faster for children than spending for any other age group,¹¹ making the identification and reduction of low value care a high priority in pediatrics. Striking evidence of geographic variations in health care for children—from rates of tonsillectomy to asthma hospitalizations to immunizations¹²—highlights the need for further research into underuse of high value care (HVC) as well as overuse of low value services. In pediatrics,

ignoring health care value has especially influential, lifelong effects by jeopardizing the health of today's children and tomorrow's adults.

Value-based care has not been a focus of medical education in the United States despite low-value physician decision-making being associated with an estimated \$280 billion in wasteful health care dollars spent annually.^{13,14} Instead, medical education has historically overemphasized expansive differential diagnoses and workups leading to heroic diagnoses of rare diseases, while admonishing diagnostic errors of omission. Perhaps as a result, “overdiagnosis” (the detection of an abnormality that does not benefit the patient) has increasingly been cited as a problem in pediatric health care value.¹⁵ Thus, it is imperative that value-based care be a new focus of education for trainees and practicing physicians to avoid such overuse of low value care (eg, head computed tomography imaging for minor head trauma) and underuse of HVC (eg, vaccinations).

Because of the pressing need to provide HVC education to trainees, the president of the American College of Physicians (ACP) encouraged the Accreditation Council for Graduate Medical Education (ACGME) to elevate “cost-consciousness and stewardship of resources” to a seventh general competency in 2011.¹⁶ In further support, a consortium of medical educators proposed a set of educational competencies in health care value.³ In pediatrics, a national survey of chief residents and program directors showed that most would be interested in implementing a HVC curriculum, if one were available.¹⁷ Accordingly, the Association of Pediatric Program Directors Curriculum Task Force identified HVC education as 1 of its top 3 priorities in 2015.¹⁸

However, despite these recommendations there are few standardized curricula that prepare pediatric trainees for high value clinical practice, and hardly any widely

Table 1. PedsValue Module Process Following the Kern Framework for Curriculum Development¹

Kern Framework Step	PedsValue Module Process
Step 1: problem identification	US health care quality and cost-effectiveness rank poorly compared with other industrialized nations. Few educational resources teach pediatric trainees to practice high value pediatric care. Ideally, curricula would teach high value care as a core element of pediatric education.
Step 2: targeted needs assessment	An emerging literature on value knowledge, skills, and attitudes in pediatric education ² and pilot programs at major academic pediatric residency programs show that learners in clinical pediatrics lack value training, want to learn high value care, and can improve their knowledge and skills through educational interventions.
Step 3: goals and objectives	We used existing value competencies, ³ expert input (including from trainees), and group consensus to craft curricular goals and objectives.
Step 4: educational strategies	The success of previous high value care online curricula in internal medicine and the need for readily accessible content nationally made case-based online modules appealing.
Step 5: implementation	The module content was created through iterative group processes and vetted via expert external review. The modules were launched online via a Web portal in March 2016.
Step 6: evaluation	Evaluation of the curriculum's use and effect is currently under way.

available resources exist that teach value-based care. We describe the development and implementation of the first series of online, case-based educational modules designed to teach trainees and practicing physicians to deliver high value pediatric care—the PedsValue Modules.

STEP 2: NEEDS ASSESSMENT OF TARGETED LEARNERS

Few survey tools exist to assess learners' true understanding of the complex nature of practicing HVC. Most surveys to date have focused on knowledge of costs. A survey of pediatric attendings and residents at one institution reported poor knowledge of costs, charges, and reimbursements and concluded that pediatricians "needed further financial

education."² In 2010, the Alliance for Academic Internal Medicine (AAIM) and the ACP published a curriculum to teach internal medicine residents HVC in clinical practice.¹⁹ In collaboration with the ACP and AAIM, MedU, a nonprofit organization that offers virtual patient cases used by many medical schools, created 6 online HVC cases for medical students in 2015.²⁰ Although there has not been a similar concerted national effort by pediatric societies to develop a curriculum for pediatric trainees, a number of educators at individual institutions have tried to fill this curricular gap in pediatrics. We describe needs assessments and preliminary curricula from 2 such institutions in the following sections.

DUKE UNIVERSITY MEDICAL CENTER

Responses from an optional survey of pediatric and internal medicine-pediatric residents (response rate 48.6%; $n = 34$ of 70) before curriculum implementation self-reported "poor" knowledge of insurance types/payment models by 38% ($n = 13$) and "poor" knowledge of costs by 35% ($n = 12$). Ninety-seven percent of respondents ($n = 33$) believed knowing more about health care costs and payment models would affect their ordering habits.

In response to this knowledge gap, Duke University Medical Center created 7 didactic lectures in HVC for pediatric residents. The lectures were adapted from the AAIM-ACP HVC curriculum and incorporated pediatric cases developed from specific areas of inappropriate use on the basis of American Board of Internal Medicine Foundation's "Choosing Wisely" lists, evidence-based guidelines, and perceived practice of overuse at the institution. Faculty of the hospitalist and primary care divisions deliver the curriculum during morning report conferences. Residents' qualitative evaluations of the sessions were overwhelmingly positive and consistently commented that they introduced important concepts otherwise unaddressed in the residency curriculum.²¹

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

In 2014, University of California, San Francisco (UCSF) held a 7-part didactic series on value in pediatrics. The value series covered basic knowledge (eg, costs vs charges, major drivers of costs in pediatrics, cost utility analysis), value-based management (eg, high value diagnosis and treatment of urinary tract infection), key policy factors shaping value in pediatrics (eg, Affordable Care Act, physician reimbursement, financial incentives), and a session on the lifelong return on investment of pediatric care (eg, cost utility of vaccines, developmental services, and prevention). Chief residents, faculty, and pharmacists taught the didactics, which were delivered at the program's affiliated tertiary/quaternary teaching hospital site during noon conferences.

Forty percent of the program's pediatric residents attended at least 1 of the optional value lectures. Three months later, 58% ($n = 46$) of all residents (including those who had not attended any value lectures) participated in a voluntary survey administered via e-mail to assess their knowledge, skills, and attitudes regarding HVC. Among

those who completed the survey, half had attended 1 or more value lectures. Those that had attended 1 or more of the didactics were significantly more likely to report understanding of major drivers of pediatric costs (odds ratio (OR), 1.7; 95% confidence interval [CI], 1.1–1.9), cost-effectiveness and cost utility (OR, 2.4; 95% CI, 1.3–4.3), and the difference between costs and charges (OR, 2.4; 95% CI, 1.1–5.3), after adjusting for gender and year of training. Those who attended 1 or more of the didactics also reported feeling more prepared to discuss the costs of common pediatric tests (OR, 2.4; 95% CI, 1.5–3.9), the cost-effectiveness of common pediatric tests (OR, 1.9; 95% CI, 1.3–2.9), and how differences in reimbursement affect care value (OR, 1.4; 95% CI, 1.1–2.0; unpublished data).

DEVELOPMENT OF THE PEDSVALUE MODULES

Although various pediatrician-educators have created materials to teach trainees and faculty HVC at their individual institutions, no pediatric-focused HVC educational tools had yet been developed across institutions or endorsed for national implementation by any pediatric professional society. Our team of pediatrician-educators who were each working on value-based curricular material across 6 academic health centers (Duke University Medical Center, UCSF, University of California Los Angeles, Texas Children's Hospital, Seattle Children's Hospital, and Children's National Health System) convened to discuss a collaborative project.

STEP 3: GOALS AND OBJECTIVES

The overall goal of the curriculum was to develop a series of Web-accessible, case-based HVC educational modules for trainees and practicing physicians in pediatrics, the PedsValue Modules. To accomplish this, we agreed upon a set of overarching HVC learning objectives and competencies for all of the modules that included 1) avoid unnecessary testing, 2) use emergency- and hospital-level care judiciously, 3) improve outcomes with health promotion and disease prevention, and 4) overcome barriers to HVC. The learning objectives were derived from those used in the AAIM-ACP curriculum and in the MedU online cases. The competencies were drawn from a set of 21 published HVC competencies and focused on the 14 competencies of beginner and proficient.³ Each case in the curricula also had its own specific learning objectives, which were mapped to one of the HVC competencies and also to specific ACGME pediatric milestones to aid program directors in using these modules for resident assessment.

STEP 4: EDUCATIONAL STRATEGIES

Six commonly encountered cases were chosen to highlight these learning objectives, competencies, and milestones focused on areas of overuse and inappropriate use specific to pediatrics. The value tenets highlighted in these cases were drawn from Choosing Wisely lists, the

American College of Radiology Appropriateness Criteria, and published evidence-based clinical practice guidelines. They emphasized 1 of 3 HVC categories: High Value Diagnostic Testing, High Value Communication, and High Value Management Across Settings.

The 6 clinical vignettes were selected as examples in which overtesting, poor communication, or inappropriate care delivery setting often result in lower value care. The cases include: vaccine-related fever, bronchiolitis, urinary tract infection, asthma exacerbation, osteomyelitis, and minor head trauma. In each vignette, the learner encounters multiple decision and reflection points for the application of HVC and evidence-based medicine principles, fulfilling the previously identified objectives and meeting competencies along the way. An example of a case roadmap with case description, learning objectives, HVC competencies met, and ACGME milestones addressed is included in [Table 2](#).

Cases were written with reference to evidence-based guidelines and clinical decision tools. Each case was reviewed by multiple external established pediatric experts in HVC topics and esteemed clinician-educators. Reviewers were chosen on the basis of their expertise and publication record. They were also solicited from the Academic Pediatric Association Healthcare Value Special Interest Group, consisting of >90 collaborating pediatrician-educators interested in cost and quality. In addition, a small group of pediatric residents with an interest in HVC reviewed the cases and offered feedback on content and presentation. Each case was designed to be completed in 30 minutes.

STEP 5: IMPLEMENTATION

Because learner preferences and training program educational needs vary, we developed materials that can be adapted for use in a variety of settings to increase their utility and likelihood of being integrated meaningfully into existing pediatric curricula. The PedsValue Modules are available as online case modules organized around themes in value-based care, best suited for self-directed learning by an individual with Web access. They were modeled after the ACP Online Interaction High Value Care cases that had been tested and evaluated on a range of learners from medical students to practicing physicians in internal medicine. Facilitator guides were also developed to accompany these pediatric modules to expand their educational versatility for group settings such as morning reports, noon conferences, case simulation, or night float curricular settings.

The PedsValue Modules are currently available at no charge via the ACP Web site.²² Although the modules were initially developed for trainees, the material is written for all practicing pediatricians. The modules each earn 1 hour of continuing medical education credit and are also approved for maintenance of certification part II through the American Board of Pediatrics.

The PedsValue Modules were developed by a multi-institution collaborative with funding by a UCSF Center for Healthcare Value "Teaching to Choose Wisely" award. The cases have joint endorsement by the Academic

Table 2. Roadmap of Bronchiolitis PedsValue Module

Learning Objective	High Value Care Competencies ³	ACGME Pediatric Milestones
Case: bronchiolitis in an 8-month-old boy with cough, increased work of breathing, and fever List the potential harms of unnecessary chest imaging and unnecessary medications in children with viral respiratory infections	Demonstrate understanding of the need for changes in clinical approaches on the basis of evidence, clinical outcomes, and cost-effectiveness to improve outcomes for patients (proficient)	Critically evaluate and apply current medical information and scientific evidence for patient care (MK1) Work in interprofessional teams to enhance patient safety and improve patient care quality (SBP3)
Use evidence-based guidelines for the appropriate management of bronchiolitis (AAP Clinical Practice Guidelines)	Demonstrate understanding of the need for changes in clinical approaches on the basis of evidence, clinical outcomes, and cost-effectiveness to improve outcomes for patients (proficient)	Critically evaluate and apply current medical information and scientific evidence for patient care (MK1)
Recognize barriers to high value care in clinical practice and explore ways of overcoming these barriers	Identify system changes that promote safe, quality, and cost-effective care (proficient)	Advocate for quality patient care and optimal patient care systems (SBP2) Systematically analyze practice using quality improvement methods and implement changes with the goal of practice improvement (PBL13)
Identify strategies to negotiate a care plan with patients/families that addresses their concerns and overcomes barriers to high value care	Discuss cost-conscious care with patients, other providers, administrators, and leaders (beginner)	Communicate effectively with patients, families, and the public, as appropriate, across a broad range of socioeconomic and cultural backgrounds (ICS1) Professionalization: a sense of duty and accountability to patients, society, and the profession (PROF1)
Estimate the cost implications of inpatient versus outpatient care	Describe basic health policy concepts of access, cost, and resource allocation, including their relationship to each other and their effect on patient care (beginner) Demonstrate understanding of how various health care system incentives and restrictions affect care plans for patients (proficient)	Recognize that ambiguity is part of clinical medicine and to recognize the need for and to use appropriate resources in dealing with uncertainty (PROF6)

AAP indicates American Academy of Pediatrics; ACGME, Accreditation Council for Graduate Medical Education; ICS, interpersonal and communication skills; MK, medical knowledge; PBL, problem-based learning; PROF, professionalism; and SBP, systems-based practice.

Pediatric Association and the ACP and serve as a pediatric complement to the internal medicine-focused AAIM-ACP Online High Value Care Cases and the Duke pediatric high value curriculum.²¹

STEP 6: EVALUATION AND FEEDBACK

The PedsValue Modules launched in April 2016. To evaluate the educational effect of the modules, we will be measuring learner participation, self-reported changes in knowledge, and self-reported changes in clinical behavior and practice. Web analytics will allow for assessment of scale and reach by tracking number and location of views of the online modules and downloads of facilitator guides. Changes in trainee attitudes and knowledge as a result of use of the PedsValue Modules will be assessed via postmodule quizzes that will be built into the online interface. These quizzes will measure changes in learners' confidence and competence (ie, self-efficacy) with pediatric HVC topics on a Likert scale. Improvement in self-reported competence and knowledge will be analyzed in aggregate for all visits and for unique and first-time learner visits on the basis of descriptive and inferential statistical analyses using postmodule data.

Anticipated changes in participants' self-reported behavior will be assessed as well. Participants will be asked to assess future practice changes they foresee making as a result of completing the module. The data and responses from the evaluation tools will be used to help inform future revisions and modifications of the PedsValue Modules. Although we do not have the capability to assess participants' actual change in behavior or skill, we included HVC competencies and milestones in curriculum development such that program directors could use this curriculum to potentially measure such educational outcomes at the individual or program level.

LIMITATIONS

There are several limitations of this curriculum development. First, we were unable to predict the extent of reach and utilization before implementation. Although facilitator guides are available, we do not have an assessment by nondevelopers of how useful the facilitator guides will be or the likelihood that implementers will be able to use the materials in the way the authors intended. We currently do not have any outcome data. The outcome data that we are in the process of collecting does not include

assessments beyond self-reported changes in knowledge and clinical behavior.

CONCLUSION

Pediatrics faces an imperative to deliver high value clinical care that will improve the lives of generations of children and the adults they will become. New and emerging value-based tools and educational resources, such as the PedsValue Modules, represent an important shift in pediatric medical education toward preparing the future pediatric clinical workforce to practice HVC. The PedsValue Modules can serve not only residency program directors in search of standardized HVC curriculum, but also residents creating self-study curricula or pediatricians already in practice. Through collective commitment to furthering this shift in pediatric education toward greater emphasis on value, we hope to begin to bend the value curve in health care for the youngest patients who have the most to gain.

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REFERENCES

- Kern DE, Thomas PA, Howard DM, et al. *Curriculum Development for Medical Education: A Six-step Approach*. Baltimore: Johns Hopkins Press; 1998.
- Rock TA, Xiao R, Fieldston E. General pediatric attending physicians’ and residents’ knowledge of inpatient hospital finances. *Pediatrics*. 2013;131:1072–1080.
- Moriatos C, Dohan D, Spetz J, et al. Defining competencies for education in health care value. *Acad Med*. 2015;90:421–424.
- Office of the Actuary, National Health Statistics Group. National Health Expenditure Data: Projections. Baltimore: Center for Medicare & Medicaid Services. Available at: <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical.html>; 2015. Accessed May 20, 2017.
- Isaacs JB. *A Comparative Perspective on Public Spending on Children*. Brookings Institute. Available at: https://www.brookings.edu/wp-content/uploads/2016/07/2_comparative_perspective_isaacs.pdf; 2009. Accessed May 20, 2017.
- OECD.Stat. Health status. Available at: http://stats.oecd.org/Index.aspx?DatasetCode=HEALTH_STAT. Accessed October 9, 2016.
- Chapter 2. *Comparative Child Well-Being Across the OECD*. Available at: <http://www.oecd.org/els/family/43570328.pdf>. Accessed May 20, 2017.
- Porter ME. What is value in health care? *N Engl J Med*. 2010;363:2477–2481.
- Mangione-Smith R, McGlynn EA. Assessing the quality of healthcare provided to children. *Health Serv Res*. 1998;33:1059–1090.
- Mangione-Smith R, DeCristofaro AH, Setodji CM, et al. The quality of ambulatory care delivered to children in the United States. *N Engl J Med*. 2007;357:1515–1523.
- Lassman D, Hartman M, Washington B, et al. US health spending trends by age and gender: Selected years 2002–2010. *Health Aff (Millwood)*. 2014;33:815–822.
- The Dartmouth Atlas of Children’s Health Care in Northern New England*. Available at: http://www.dartmouthatlas.org/downloads/atlas/NNNE_Pediatric_Atlas_121113.pdf. Accessed May 20, 2017.
- Kelley R. *Where Can \$700 Billion in Waste Be Cut Annually From The U.S. Healthcare System?* Available at: http://healthcarereform.procon.org/sourcefiles/thomson_reuters_study_medical_waste_2010.pdf. Accessed May 20, 2017.
- Yong PL, Saunders RS, Olsen L, eds. *The Healthcare Imperative: Lowering Costs and Improving Outcomes: Workshop Series Summary*. Washington, DC: National Academies Press; 2010.
- Coon ER, Quinonez RA, Moyer VA, et al. Overdiagnosis: how our compulsion for diagnosis may be harming children. *Pediatrics*. 2014;134:1013–1023.
- Weinberger SE. Providing high-value, cost-conscious care: a critical seventh general competency for physicians. *Ann Intern Med*. 2011;155:386–388.
- Tchou M, Burgener E, Hensley A, et al. Teaching residents to provide high-value care: evaluation of cost-conscious care curriculums in pediatric residencies. *Acad Pediatr*. 2015;15:e9.
- Letter written by Dr. Rebecca Blankenburg, chair of the APPD Curriculum Task Force, in support of the PedsValue Modules for the UCSF Center for Healthcare Value grant application, May 15, 2015.
- Smith CD. Teaching high-value, cost-conscious care to residents: the Alliance for Academic Internal Medicine–American College of Physicians Curriculum. *Ann Intern Med*. 2012;157:284–286.
- MedU. *High Value Care Course*. Available at: <http://www.med-u.org/population-health/high-value-care-hvc>. Accessed March 19, 2017.
- AAMC. MedEdPORTAL Publications. *High Value Care Pediatric Curriculum*. Available at: <https://www.mededportal.org/publication/10146>. Accessed May 20, 2017.
- American College of Physicians. *High Value Care Pediatric Cases*. Available at: <https://www.acponline.org/clinical-information/high-value-care/resources-for-clinicians/high-value-care-pediatric-cases>. Accessed March 19, 2017.