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## Deimplementation in Pediatrics:

### Past, Present, and Future

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The 20th century heralded major advancements in pediatric health care including vaccinations, antibiotics, and sophisticated radiographic studies. These interventions led to substantial improvements in child mortality. Yet, as medical interventions became more commonplace, concerns about negative health effects developed. As a result, many of the changes to pediatric practice in the 21st century have actually involved deimplementation, the process of reducing care that is harmful, ineffective, overused, or not cost-effective. Despite this progress, many practices persist that are not supported by evidence. This Viewpoint explores the historical drivers of deimplementation and proposes ways to further reduce the amount of low-value care delivered to children.

### Decreased Prevalence of Disease

Vaccinations, improved hygiene, and rigorous public health screening led to declines in the prevalence of infectious diseases, notably *Streptococcus pneumoniae*, *Haemophilus influenzae* type b, group B streptococcus, and *Mycobacterium tuberculosis* (Table). In response, several different criteria (Boston, Rochester, Children's Hospital of Philadelphia, and Lab-score) were developed to reduce the need for testing and hospitalizing febrile infants. One quality improvement initiative used the modified Rochester criteria to reduce the rate of lumbar punctures in low-risk infants from 32% to 0%.<sup>1</sup> The application of the Kaiser Sepsis Score, which incorporates maternal group B streptococcus status, resulted in 48% fewer neonates being treated empirically for suspected early-onset sepsis.<sup>2</sup> As

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*Mycobacterium tuberculosis* prevalence declined, the positive predictive value of Mantoux tests decreased, and recommendations evolved from universal childhood *Mycobacterium tuberculosis* screening to risk-based screening.<sup>3</sup>

## The Rise of Evidence-Based Care

As large, rigorous pediatric studies became more common, the basis of pediatric recommendations shifted from expert opinion to higher levels of evidence, such as randomized clinical trials. The ability to conduct large scientific studies is made possible by multisite research consortia, integrated managed care networks, national databases, and greater investment in child health research. One research consortium, the Pediatric Emergency Care Applied Research Network, developed stratification criteria to determine which children with head injuries need imaging. Using these criteria, one quality improvement initiative was able to decrease the rate of computed tomography scans from 29% to 17%.<sup>4</sup>

The Grading of Recommendations Assessment, Development and Evaluation system, developed in 2004, ranks scientific studies by study type and bias. National and international bodies including the Cochrane Collaboration, the US Preventive Services Task Force (USPSTF), and the American Academy of Pediatrics use this system and others to evaluate the quality of scientific studies and synthesize results. The USPSTF gives preventive services that are based on high-quality evidence of improved outcomes an A recommendation, whereas services that are ineffective or cause harm are given a D. Cervical cancer screening for individuals younger than 21 years is an example of a D grade because the risks of screening were found to outweigh the benefits in this population.<sup>5</sup>

## Growing Recognition of Harms From Overuse

False positives on screening tests can lead to harms from anxiety and often invasive additional testing. Overdiagnosis can lead to stigmatization, insurance denial, and unnecessary treatment. Overtreatment can cause adverse drug reactions, end-organ damage from medications, alterations in the microbiome, and unnecessary radiation. There are also opportunity costs, which are particularly pronounced in short primary care visits. For example, if a clinician screens for bacteriuria in an asymptomatic nonpregnant adolescent (not recommended), there may not be time to administer a validated depression screen (recommended). The financial costs of overuse are estimated to be in the hundreds of billions of dollars and contribute to rising out-of-pocket costs.

In 2012, *Choosing Wisely* was launched to help patients and clinicians choose care that is “supported by evidence, not duplicative of other tests or procedures already received, free from harm, and truly necessary.”<sup>6</sup> The Lown Institute, founded in 2012, began publishing its Right Care series in *The Lancet* to describe the scope of overuse and underuse across the globe. The *Journal of Hospital Medicine* and *Hospital Pediatrics* developed dedicated sections that illustrate the dangers of low-value care. *JAMA Pediatrics* has published annual updates on pediatric overuse to highlight new evidence that can help guide future deimplementation.

## The Future of Pediatric Deimplementation

Niven et al<sup>7</sup> identified 4 stages of deimplementation including (1) identifying low-value services, (2) facilitating the deadoption process, (3) evaluating deadoption outcomes, and (4) sustaining deadoption. There has been significant progress in the identification of low-value services, but overuse continues. Guidelines alone seem insufficient to change clinical practice. There are many factors at the level of the patient (parental pressures, direct-to-consumer advertising), clinician (fear of missing a diagnosis, malpractice suits), and health care system (fee-for-service reimbursement, short visit times) that continue to drive pediatric overuse. Cognitive biases such as the endowment effect also make clinicians less likely to end historical practices.

Many different approaches have been used to reduce low-value care in adults including reimbursement restriction, risk sharing, patient and clinician education, audit and feedback of clinician performance, and clinical decision support tools. One systematic review found that multicomponent interventions were most successful.<sup>8</sup> Initiatives such as the Bronchiolitis Quality Improvement Project have used collaborative, multisite, multicomponent approaches to move beyond the first stage of deimplementation and create sustained changes in practice. More research is needed to understand which combinations and in what settings interventions are most effective for other types of pediatric overuse.

We will need to continually reevaluate which practices need to be deimplemented as disease prevalence changes, new evidence emerges, new technology is developed, and cultural values shift. For example, as rapid pathogen detection becomes more feasible, there may be decreased need for tests that attempt to identify infectious diseases such as complete blood cell counts or chest radiographs. To keep pace with the rapidly changing landscape of evidence, we propose the development of a pediatric deimplementation science that measures the harms of overuse, assesses the unintended consequences of doing less, and studies the best ways to minimize the delivery of low-value care in children.

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Forces Contributing to Deimplementation in Pediatrics

Table.

Theme	Underlying factor	Example of underlying factor	Example of deimplementation
Decreased prevalence of disease	Vaccinations	<i>Haemophilus influenzae</i> type b vaccine <i>Streptococcus pneumoniae</i> conjugate vaccine	Fewer lumbar punctures recommended in the evaluation of febrile infants and in simple febrile seizures
	Public health campaigns	Universal screening and treatment of group B streptococcus in pregnant women	Risk-based rather than universal laboratory testing and antibiotics for neonates born to febrile mothers
Evidence-based care	Criteria to evaluate evidence	Treatment of latent and active tuberculosis Grading of Recommendations Assessment, Development and Evaluation	Risk-based rather than universal tuberculosis screening in children
	Organizations to synthesize evidence	US Preventive Services Task Force Cochrane Collaboration American Academy of Pediatrics	
	Growing evidence base	Databases (eg, Pediatric Health Information System) Research consortiums Clinical setting (eg, PECARN) Age based (eg, Better Outcomes for Newborns through Research) Managed care organizations (eg, Kaiser Permanente)	Routine urinalyses not recommended for asymptomatic children at well-child visits Computed tomography scans for head injury is limited through use of PECARN criteria Cervical cancer screening not recommended for patients younger than 21 y Corticosteroids and bronchodilators not recommended for bronchiolitis Blood tests not recommended in the evaluation of simple febrile seizure
	Ability to conduct high-quality randomized clinical trials	Improved public and private funding	
Recognition of the harms of overuse	Overdiagnosis, overtreatment, and opportunity costs of overuse	Choosing Wisely initiative <i>Journal of Hospital Medicine's</i> Things We Do For No Reason section <i>Hospital Pediatrics'</i> Bending the Value Curve section	Neuroimaging not recommended in the evaluation of simple febrile seizure

Abbreviation: PECARN, Pediatric Emergency Care Applied Research Network.