PEDIATRICS PERSPECTIVES

Delay in State Adoption of Newborn Screening Tests

Ang Xu, BA,[a] Vignesh Ganapathy, JD,[b] Stephanie R. Morain, MPH, PhD[a,c]

Newborn screening is a critical public health intervention. Every year, thousands of newborns are diagnosed with a disease via newborn screening; this allows for timely treatment that decreases morbidity and mortality and generates considerable health care savings. In 2005, the Secretary's Advisory Committee on Heritable Disorders in Newborns and Children (SACHDNC) proposed the Recommended Uniform Screening Panel (RUSP), consisting then of 29 core conditions to adopt as the national newborn screening standard. The RUSP's core conditions and any future additions had to meet 3 inclusion criteria: the disorder must be detectable within 48 hours of birth, the screening test must be sensitive and specific, and early detection must enable early treatment to secure proven benefit.[1]

Adding a condition to the RUSP is a rigorous, multistep process. Petitioners must write a report to the SACHDNC, presenting an overview of the condition, treatment efficacy and availability, validation of a laboratory test with available follow-up confirmatory testing, and a prospective population pilot study. Meeting these criteria can prove challenging. For example, the addition of mucopolysaccharidosis I (MPS I) and adrenoleukodystrophy were delayed because both diseases have a relatively unaffected carrier population, raising concern as to whether screening would pick up carrier patients. The SACHDNC then makes recommendations to the Secretary on the basis of an independent external evaluation regarding both inclusion criteria and feasibility. States are not legally bound by the RUSP and can choose whether and when to adopt any condition within their own programs.

Since its initial release, 5 disorders have been added to the RUSP: severe combined immunodeficiency (SCID) (prevalence per live birth: 1.7 out of 100 000) and critical congenital heart disease (CCHD) in 2010 (prevalence: 80 out of 100 000), Pompe disease in 2015 (3.6 out of 100 000), and MPS I (1.1 out of 100 000) and adrenoleukodystrophy (5.9 out of 100 000) in 2016.

Before the RUSP, there was considerable variation across states with respect to newborn diseases screened.[2] The RUSP was aimed at reducing this variation. In 2003, 46 states screened for only 6 disorders. By 2011, all 50 states screened for at least 26 disorders.[1] Unfortunately, as the

[c]*Center for Medical Ethics and Health Policy,* [a]*Baylor College of Medicine, Houston, Texas; and* [b]*American Civil Liberties Union of Kansas, Overland Park, Kansas*

Mr Xu conceptualized the project, collected and analyzed data, and drafted the initial manuscript; Mr Ganapathy and Dr Morain reviewed and revised the manuscript for critical intellectual content; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

DOI: https://doi.org/10.1542/peds.2017-0300

Accepted for publication Jul 25, 2017

Address correspondence to Stephanie R. Morain, MPH, PhD, Center for Medical Ethics and Health Policy, Baylor College of Medicine, 1 Baylor Plaza, Suite 310D, Houston, TX 77030. E-mail: stephanie.morain@bcm.edu

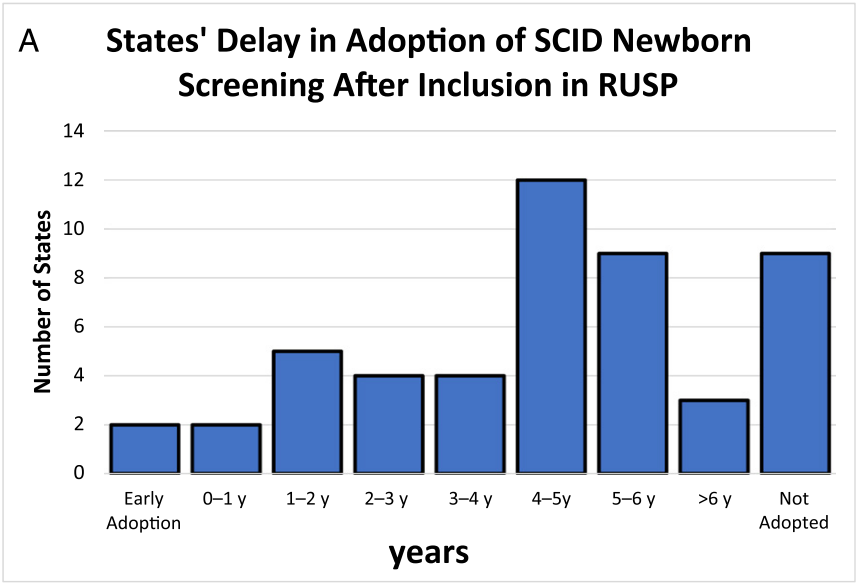
PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: No external funding.

POTENTIAL CONFLICT OF INTEREST: Mr Ganapathy is employed by the EveryLife Foundation for Rare Diseases, a nonprofit working to advance rare disease therapies; and Mr Xu and Dr Morain have indicated they have no potential conflicts of interest to disclose.

To cite: Xu A, Ganapathy V, Morain SR. Delay in State Adoption of Newborn Screening Tests. *Pediatrics.* 2018;141(1): e20170300



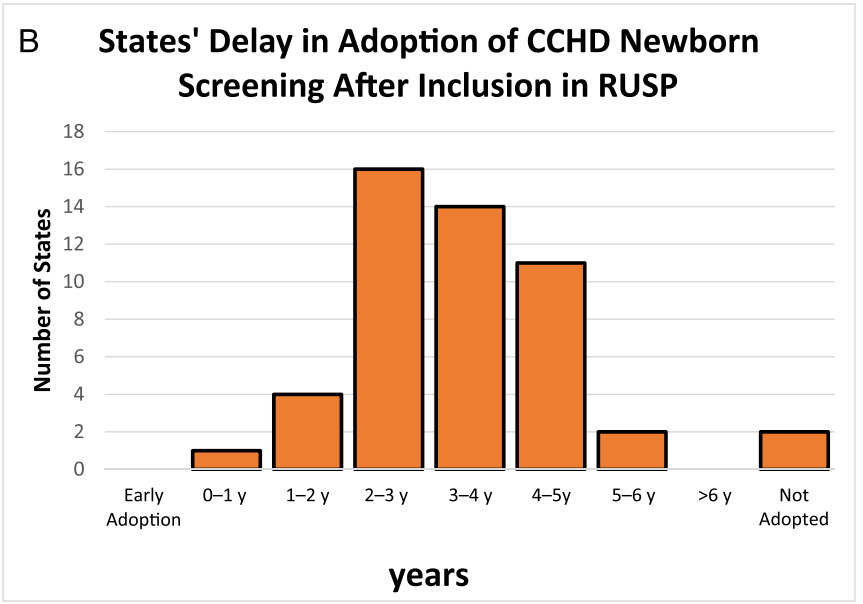


FIGURE 1
The delay in years for the adoption of (A) SCID and (B) CCHD newborn screening.

RUSP has expanded to include more disorders, state adoption of the new conditions has lagged. This lag causes disparities across states, preventable morbidity and mortality, and unnecessary health care costs: the same shortcomings the RUSP was meant to address. For example, the median delay in state adoption for SCID and CCHD is 4.4 years and 3.2 years, respectively (Fig 1). Furthermore, even after states adopt a new screening test, the time for implementation means it can take several additional years before infants are screened for the new condition.

Several factors likely drive this delay. First, the absence of a legal requirement for states to adopt RUSP recommendations means each additional condition added to the RUSP is independently reconsidered by a state legislature, a state board of health, or a similar advisory committee. Although this process enables consideration of state-specific features before implementation, including prevalence, capacity for screening, and follow-up treatment, it also creates inefficiencies from duplicated efforts because all conditions added to the RUSP have previously undergone extensive evaluation of the practicality, accuracy, and effectiveness of the new screening test. In states that require legislative action, proposals to add new conditions to each state's screening program must compete with other priorities on the state's legislative agenda. This challenge may be especially high within states with part-time legislatures, which meet for as little as 30 days a year. These challenges notwithstanding, most bills to adopt RUSP recommendations are eventually passed. This suggests delays represent barriers in implementation rather than genuine controversy on their merits.

Lastly, the addition of a new screening test may present implementation costs, including new screening platforms and the resources for short- and long-term follow-up. New screening tests that employ a different testing modality may be more difficult to implement than tests that use well-established testing modalities, such as tandem mass spectrometry. For example, a pulse oximeter is used for screening for CCHD, requiring additional staff training, new standardization protocols, and implementation of different altitudinal thresholds. New tests may also raise concern for cost-effectiveness, particularly for diseases requiring expensive, lifelong enzyme replacement therapies, such as Pompe and MPS I. Unfortunately, cost-effectiveness studies of screening and treatment of these conditions are limited. Existing data from other conditions suggest such concerns may prove unfounded, although the cost-effectiveness of new additions may vary on the basis

of type and length of treatment and the population prevalence.

WHY DELAYED UPTAKE IS PROBLEMATIC

Delays in state adoption of screening result in several shortcomings. Lagged implementation raises considerations of justice by creating geographic and socioeconomic disparities in newborn screening access. Although parents in states that require less than the full RUSP can elect to purchase supplemental newborn screening from private laboratories, such supplemental screening can be prohibitively expensive for many families. It is arguably inequitable for some newborns to miss out on screening opportunities (and their potential life-saving benefits) merely on the basis of their state of birth.

Delayed adoption also results in preventable morbidity and mortality. The definitive cure for SCID is a bone marrow transplant, but delayed diagnosis significantly decreases survival. With early diagnosis of SCID (<3.5 months old), the 5-year survival after bone marrow transplant is 94%. If the diagnosis occurs after 3.5 months, 5-year survival drops to as low as 50%.[3] Delayed diagnosis of CCHD is similarly devastating. If CCHD is diagnosed at birth, mortality is 12%, compared with 30% if CCHD is diagnosed later.[4]

On the basis of the cost-effectiveness studies available, we believe delays in implementation may increase health care costs. At the state level, the introduction of tandem mass spectrometry in California's newborn screening program was estimated to save the state $0.27 in health care costs for every dollar spent.[5] Researchers conducting studies of recent additions to the RUSP have also shown some to offset a fraction of the cost of screening. In a Washington state analysis, researchers found that every dollar spent on SCID newborn screening on average saved $0.43 in treatment costs.[6] Including the value of lives saved through these newborn screening tests leads to highly favorable benefit-cost ratios,[5,6] further highlighting the significant societal benefit of newborn screening and the harm from unnecessary delay in adoption of these recommended tests into state newborn screening panels.

A PROPOSED POLICY SOLUTION

An instructive model for addressing current shortcomings is offered in a recently passed bill in California. In senate Bill 1095, it is required for screening tests added to the RUSP to be adopted and implemented within 2 years with appropriate infrastructure for patient follow-up. We encourage other states to follow California's lead and implement similar requirements. Ultimately, any exceptions to adoption of new screening tests within 2 years should require the state to provide evidence that implementation of the test would either fail to improve newborn morbidity and mortality or fail to be cost-effective. A test's inclusion to the RUSP reflects the results of a consistent and rigorous process, guided by careful assessment of the evidence. If a condition has previously met this standard, the burden of proof should be on the states to show why a certain screening test should not be implemented. Similarly, we recommend states not adopt other conditions beyond the RUSP unless the condition has passed a similarly rigorous evaluation.

Newborn screening is an effective public health intervention that not only decreases morbidity and mortality but is also cost-effective. State governments should move quickly to adopt screening programs for those conditions added to the RUSP and to prevent lags in adoption for future additions.

ABBREVIATIONS

CCHD: critical congenital heart disease
MPS I: mucopolysaccharidosis I
RUSP: Recommended Uniform Screening Panel
SACHDNC: Secretary's Advisory Committee on Heritable Disorders in Newborns and Children
SCID: severe combined immunodeficiency

REFERENCES

1. American College of Medical Genetics Newborn Screening Expert Group. Newborn screening: toward a uniform screening panel and system—executive summary. *Pediatrics*. 2006;117(5, pt 2): S296–S307
2. Carroll AE, Downs SM. Comprehensive cost-utility analysis of newborn screening strategies. *Pediatrics*. 2006;117(5, pt 2):S287–S295
3. Pai SY, Logan BR, Griffith LM, et al. Transplantation outcomes for severe combined immunodeficiency, 2000–2009. *N Engl J Med*. 2014; 371(5):434–446
4. Eckersley L, Sadler L, Parry E, Finucane K, Gentles TL. Timing of diagnosis affects mortality in critical congenital heart disease. *Arch Dis Child*. 2016;101(6):516–520
5. Feuchtbaum L, Cunningham G. Economic evaluation of tandem mass spectrometry screening in California. *Pediatrics*. 2006;117(5, pt 2): S280–S286
6. Ding Y, Thompson JD, Kobrynski L, Ojodu J, Zarbalian G, Grosse SD. Cost-effectiveness/cost-benefit analysis of newborn screening for severe combined immune deficiency in Washington state. *J Pediatr*. 2016;172:127–135