Differing methods for guideline development result in conflicting recommendations and clinical practice variation. This article details the approach used by the US Preventive Services Task Force to issue recommendation statements, using the 2007 recommendation for screening of lipid levels as an example. An analytic framework served as the source of key questions for a systematic review of the evidence on lipid screening in children and adolescents. Evidence was insufficient, of poor quality, or conflicting to answer 7 of the 10 questions. There was no direct evidence of the benefit of lipid screening, and insufficient evidence existed in the indirect chain of evidence to support a recommendation. In 2008, the American Academy of Pediatrics issued a clinical policy statement recommending screening for targeted children. We discuss the contrasting approach to the development of this guideline. The use of a standardized method to develop clinical guidelines promotes trust and credibility among patients and clinicians.

Author Affiliations: Group Health Research Institute, Group Health Cooperative, and Department of Health Services, University of Washington, Seattle (Dr Grossman); Department of Pediatrics, Baylor College of Medicine, Houston, Texas (Dr Moyer); College of Nursing and Healthcare Innovation, Arizona State University, Phoenix (Dr Melnyk); Department of Medicine, Oregon Health and Sciences University, Portland (Dr Chou); and Department of Pediatrics, Cincinnati Children’s Hospital Medical Center, Cincinnati, Ohio (Dr DeWitt).

Group Information: A list of the US Preventive Services Task Force appears at http://www.uspreventiveservicestaskforce.org/about.htm#Members.
The recommendations of the AAP Committee on Nutrition focus on interventions in the following 2 domains: (1) whether to encourage clinicians to promote exercise and healthy patterns of eating among high-risk children and (2) whether to screen using a lipid panel. We focus only on the controversies associated with the question concerning lipid screening and not other parts of the policy statement.

Using the same available evidence base as the AAP Committee on Nutrition, the USPSTF concluded that there was insufficient evidence to recommend for or against routine screening of lipids for any group of children and teenagers. The USPSTF found that the net balance of potential benefits and harms of screening was too uncertain to warrant a recommendation for routine screening in this population.4

The differences between the 2 recommendations on lipid screening by these well-respected organizations provide an opportunity to compare and contrast the methods used by the USPSTF and the AAP Committee on Nutrition.

**THE USPSTF PROCESS**

The development of the USPSTF recommendations is anchored on the following set of key principles:

1. Use of a reproducible evidence-based method. All USPSTF recommendations are based on full or targeted systematic evidence reviews using clear and explicit methods, including an analytic framework, key questions, and a standard approach to grading evidence and recommendation statements.8,9

2. Scientific peer review of the methods, evidence summaries, and recommendations.10

3. Recommendations that hinge on net health benefit to people, with consideration of potential harms and benefits of screening and therapeutic interventions. Where insufficient data exist to estimate the magnitude of benefit or harm, recommendations are not made.

4. Rigorous conflict-of-interest policy. Potential conflicts of interest among USPSTF members are routinely screened and reviewed by the scientific director and USPSTF chairs for each topic review.

These principles drive a sequential standardized process composed of these main steps (Table 1): (1) key question formulation; (2) evidence collection, assessment, and synthesis (including meta-analysis, if appropriate); (3) recommendation development11-13; and (4) external peer and public review. The current USPSTF method documentation for clinical recommendations is summarized in a continuously updated procedure manual available to the public on its Web site.14

This process of evidence-based guideline development closely parallels that of the traditional scientific inquiry, in which key study questions are identified, and a transparent method is used to drive the data collection process and analysis of retrieved literature. In the case of guideline development, the data collection process is a comprehensive, systematic search of the scientific literature, with clear decision rules designed to capture the highest possible proportion of relevant information.

The USPSTF developed its recommendations for lipid screening on the basis of a specific analytic framework used

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**Table 1. Steps for USPSTF Recommendation Statement Formulation**

<table>
<thead>
<tr>
<th>Process Step</th>
<th>Who Performs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic nomination and prioritization</td>
<td>USPSTF, USPSTF partners</td>
</tr>
<tr>
<td>Development of analytic framework</td>
<td>USPSTF topic work group</td>
</tr>
<tr>
<td>Evidence search, grading, and synthesis</td>
<td>AHRQ or evidence practice center</td>
</tr>
<tr>
<td>Evidence synthesis review and draft recommendation review</td>
<td>USPSTF, external peer reviewers, partners, public discharge center</td>
</tr>
<tr>
<td>Final recommendation and letter grade assignment</td>
<td>USPSTF</td>
</tr>
<tr>
<td>Publication of final recommendations and systematic review</td>
<td>Journal and external peer reviewers</td>
</tr>
<tr>
<td>Dissemination of recommendation to stakeholders</td>
<td>AHRQ</td>
</tr>
</tbody>
</table>

to narrow the evidence review to the key questions that would have the greatest leverage on a decision to recommend, not recommend, or abstain from recommending lipid screening. Ten possible questions (Figure and Table 2) were derived for the analytic framework, all of which can be reviewed in the USPSTF evidence synthesis.\textsuperscript{15} The searches for relevant studies were based on these questions. Evidence from key question 1 would provide direct evidence of the effectiveness of lipid screening among children by identifying controlled trials of screening compared with no screening, with information on long-term health outcomes, reaching into adulthood. Because no literature of this type was found in this review, the USPSTF focused on the remaining key questions (2-10) in an effort to assemble a chain of indirect evidence, using the sequential steps of the screening process. An example of an indirect chain of evidence to support screening is one that shows that a screening test accurately identifies persons with or at high risk for the target condition, that effective treatments are available to treat the target condition, and that harm due to screening and treatment is outweighed by the benefits. For adult obesity screening, the USPSTF recommendations were based on indirect evidence of health benefits of screening using body mass index as an outcome associated with important clinical outcomes. To achieve this threshold of benefit, evidence was independently assembled to assess the accuracy and reliability of the screening test, the effectiveness of interventions on weight loss, the effectiveness of weight loss on intermediate outcomes (eg, blood pressure and lipid levels), and the effectiveness of weight loss on clinical outcomes (eg, mortality, daily functioning, prevention of chronic disease).\textsuperscript{16} Gaps in any sequence of the evidence chain because of insufficient or poor-quality studies affect the level of certainty regarding the balance of benefit and/or harm associated with the screening process.

As part of its recommendation process, the USPSTF publishes the complete literature synthesis or a targeted update of a previous synthesis. Literature syntheses are performed by researchers from the AHRQ (the federal sponsor of the USPSTF) or one of the academic evidence-based practice centers under contract to the AHRQ. Evidence grading of individual studies, using a standard explicit criteria appropriate to study design (available at: http://www.ahrq.gov/clinic/uspstf08/methods/procmanualap7.htm), is performed by the group performing the synthesis and summarized in the published evidence tables.

The USPSTF found important gaps in the scientific literature concerning many of these key questions regarding pediatric lipid level screening (see Table 2 for itemization of key questions and evidence conclusions). Of the 10 key questions, 7 contained evidence that was insufficient, of poor quality, or conflicting regarding the answers. No studies directly evaluated benefits of screening compared with no screening. Regarding the indirect evidence on screening, evidence was most abundant for the question that focused on the effect of statin medications on lipid levels. However, lipid levels are an intermediate (nonclinical) outcome. There was insufficient evidence to determine the benefits of screening on clinical outcomes (eg, future cardiovascular events) or risk of adult dyslipidemia, or to accurately estimate long-term harms of treatments that might be initiated as a result of screening (eg, effects of long-term therapy with statins). In addition, the trials were conducted among children with dyslipidemia syndromes and may not be applicable to children with multifactorial dyslipidemia, as seen with obesity. Although evidence was available to address certain questions about lipid screening in children and teenagers, a complete chain of indirect evidence could not be assembled that would support a recommendation for screening among average or high-risk children and teenagers.

The USPSTF voted to rate pediatric lipid screening with an “I” statement (Insufficient evidence to recommend for or against screening), concluding that the current evidence was insufficient to assess the balance of benefits and harms of the service. Because the balance of benefits and harms could not be determined, the certainty of net benefit was low (Table 3).\textsuperscript{17} The “I” statement for this recommendation recognizes that clinicians take
### Table 2. Main Findings of USPSTF Evidence Review on Lipid Screening Among Children and Adolescents

<table>
<thead>
<tr>
<th>Key Question</th>
<th>Main Conclusion</th>
</tr>
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<tbody>
<tr>
<td>1. Is screening for dyslipidemia in children/adolescents effective in delaying the onset and reducing the incidence of CHD-related events?</td>
<td>No studies compared outcomes of screening for dyslipidemia vs no screening</td>
</tr>
<tr>
<td>2. What is the accuracy of screening for dyslipidemia in identifying children/adolescents at increased risk of CHD-related events?</td>
<td>See 2a-2f</td>
</tr>
<tr>
<td>2a. What are abnormal lipid values in children/adolescents?</td>
<td>Reference lipid values for children and adolescents are based on epidemiologic data</td>
</tr>
<tr>
<td>2b. What are appropriate tests? How well do screening tests (nondiagnostic total cholesterol, fasting total cholesterol, and fasting lipoprotein analysis) identify individuals with dyslipidemia?</td>
<td>Poor evidence on the diagnostic accuracy of screening tests other than LDL-C</td>
</tr>
<tr>
<td>2c. How well do lipid levels track from childhood to adulthood?</td>
<td>Good evidence that 40%-55% of children with elevated lipid levels have abnormal values 4-15 y later</td>
</tr>
<tr>
<td>2d. What is the accuracy of family history in determining risk?</td>
<td>Good evidence that family history is 30%-70% sensitive for identifying children with dyslipidemia; 25%-55% of children would undergo testing based on a positive family history finding</td>
</tr>
<tr>
<td>2e. What are other important risk factors?</td>
<td>Good evidence that overweight is the best predictor after LDL-C levels for future adult dyslipidemia and cardiovascular risk</td>
</tr>
<tr>
<td>2f. What are effective screening strategies for children/adolescents (including frequency of testing, optimal age for testing)?</td>
<td>Poor evidence on harms of screening</td>
</tr>
<tr>
<td>3. What are the adverse effects of screening (including false-positive and false-negative findings and labeling)?</td>
<td>Fair evidence of low parental adherence to screening and follow-up recommendations</td>
</tr>
<tr>
<td>4. In children/adolescents, what is the effectiveness of drug, diet, exercise, and combination therapy in reducing the incidence of adult dyslipidemia and delaying the onset and reducing the incidence of CHD-related events (including optimal age for initiation of treatment)?</td>
<td>No studies evaluated effects of treatments for childhood dyslipidemia on CHD-related events or incidence of adult dyslipidemia</td>
</tr>
<tr>
<td>5, 6, 7, and 8. What is the effectiveness of drug, diet, and exercise or combination therapy for treating dyslipidemia in children/adolescents?</td>
<td>Good evidence that statin drugs reduce TC and LDL-C levels in children with familial hypercholesterolemia, but insufficient evidence in children with milder and/or nonfamilial dyslipidemia</td>
</tr>
<tr>
<td>9. What are the adverse effects of drug, diet, exercise, and combination therapy in children/adolescents?</td>
<td>Fair evidence of short-term adverse effects of statins, including elevations in liver function test results and creatine kinase levels</td>
</tr>
<tr>
<td>10. Does improving dyslipidemia in childhood reduce the risk of dyslipidemia in adulthood?</td>
<td>Insufficient evidence on long-term adverse effects of medications for hyperlipidemia</td>
</tr>
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</table>

Abbreviations: CHD, coronary heart disease; LDL-C, low-density lipoprotein cholesterol; TC, total cholesterol; USPSTF, US Preventive Services Task Force.

The use of an explicit analytic framework and set of key questions is only 1 part of the process to improve the salience, transparency, and validity of the guideline development process. All comprehensive literature reviews are sent to USPSTF members and external peer reviewers with special expertise in the scientific area under review. The AHRQ and the evidence-based practice center are keenly interested in ensuring that the literature synthesis reflects the current state of the art and that important studies that have been or are about to be published are not missing. Based on the systematic review of the literature and evidence synthesis, these pediatric lipid recommendations were jointly developed by the USPSTF members, representatives from the evidence-based practice center, and AHRQ medical officers.

Potential conflicts of interests, including financial, intellectual (eg, patent holder), and academic (eg, grant funding) conflicts, are surfaced through a standard review process conducted jointly by the USPSTF's chair and scientific officer; all significant financial, intellectual, and professional conflicts (the disclosure form is available at: [http://www.ahrq.gov/clinic/uspsftf08/methods/procmmanualap2.htm](http://www.ahrq.gov/clinic/uspsftf08/methods/procmmanualap2.htm)) are shared with all other USPSTF members and USPSTF partner organizations, and a determination is made regarding whether participation in
of guideline development. The AAP has also developed a process that is based on the key principles followed the specifications of a clinical practice guideline in the diagnosis and management of otitis media following the recommendations. The AAP guideline regarding the diagnosis and management of otitis media follows the specifications of a clinical practice guideline and is an example of a multidisciplinary, explicit, evidence-driven process that is based on the key principles of guideline development. The AAP has also developed a highly organized and thoughtful set of recommendations regarding the formulation of clinical practice guidelines; many of the principles and methods are an integral part of these recommendations.

For clinicians to have confidence in the use of guidelines issued by professional organizations, they must know about the quality of evidence and the process used to develop the recommendations. The process should be transparent and rigorous and include safeguards from conflicts of interest. Many professional medical groups have adopted a highly standardized approach to clinical practice guideline development and clearly indicate the strength of evidence behind recommendations. It is possible that the AAP would have reached a different conclusion if the Committee on Nutrition followed the approach used to develop an AAP-endorsed clinical practice guideline. Because this AAP clinical recommendation appears to have been based on less systematic and transparent methods, users may not know whether the recommendation is consistent with the evidence, whether guideline developers factored in important research gaps when developing the recommendation, or how potential conflicts of interest may have been managed.

The process used by the Committee on Nutrition to arrive at its recommendation appears to have followed the pathway of a clinical report rather than a guideline, which by AAP standards does not require an explicit review. However, such documents are viewed as policy statements from the AAP and perceived by patients and clinicians as guidelines—suggesting that similarly rigorous methods should be applied. The AAP guideline regarding the diagnosis and management of otitis media followed the specifications of a clinical practice guideline and is an example of a multidisciplinary, explicit, evidence-driven process that is based on the key principles of guideline development. The AAP has also developed a highly organized and thoughtful set of recommendations regarding the formulation of clinical practice guidelines; many of the principles and methods are an integral part of these recommendations.

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Other recent reports regarding the impact of process variation in clinical guideline development outcomes (eg, colorectal cancer screening in adults) warrant attention by practicing clinicians who depend on such recommendations to standardize and improve their practice of medicine. Primary care clinicians ultimately depend on the organizations who sponsor these guidelines to use evidenced-based and standardized methods to produce them. Their patients and patients’ families deserve nothing less.

**Table 3. US Preventive Services Task Force Recommendation Grida**

<table>
<thead>
<tr>
<th>Certainty of Net Benefit</th>
<th>Substantial</th>
<th>Moderate</th>
<th>Small</th>
<th>Zero/Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td></td>
<td></td>
<td>Insufficient</td>
</tr>
</tbody>
</table>

A, B, C, D, and Insufficient represent the letter grades of the recommendation or statement of insufficient evidence assigned by the US Preventive Services Task Force after assessing certainty and magnitude of the net benefit of the service.

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**THE AAP PROCESS**

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**Accepted for Publication:** September 9, 2010. **Correspondence:** David C. Grossman, MD, MPH, Group Health Research Institute, 1730 Minor Ave, Ste 1600, Seattle, WA 98101 (grossman.d@ghc.org). **Author Contributions:** Study concept and design: Grossman, Moyer, Melnyk, and DeWitt. Analysis and interpretation of data: Grossman, Chou, and DeWitt. Drafting of the manuscript: Grossman, Moyer, Melnyk, and Chou. Critical revision of the manuscript for important intellectual content: Grossman, Moyer, Chou, and DeWitt. Administrative, technical, and material support: Grossman. Study supervision: Grossman. **Financial Disclosure:** Dr Chou is affiliated with the Oregon evidence-based practice center that provides evidence reviews under contract to the USPSTF. **Additional Information:** Drs Grossman and Melnyk are current members of the USPSTF and participate in the...
USPSTF Child Health Workgroup. Drs Moyer and DeWitt were USPSTF members at the time the lipid statement was finalized.

Additional Contributions: Robert Reid, MD, PhD, Eric Larson, MD, MPH, Mary Barton, MD, MPP, Iris Mabry-Hernandez, MD, MPH, Joan DeClaire, BA, and Rebecca Hughes, BA, provided comments on earlier drafts of this article.

REFERENCES


