SPECIAL ARTICLE

Choosing Wisely: The American College of Rheumatology's Top 5 for Pediatric Rheumatology

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Objective. To create a pediatric rheumatology Top 5 list as part of the American Board of Internal Medicine Foundation's Choosing Wisely campaign.

Methods. Delphi surveys of a core group of representative pediatric rheumatology providers from across North America generated candidate Top 5 items. Items with high content agreement and perceived to be of prevalent use and of high impact were included in a survey of all American College of Rheumatology (ACR) members who identified themselves as providing care to pediatric patients. Items with the highest ratings were subjected to literature review and further evaluation.

Results. A total of 121 candidate items were proposed in the initial Delphi survey and were reduced to 28 items in subsequent surveys. These 28 items were sent to 1,198 rheumatology providers who care for pediatric patients, and 397 (33%) responded. Based upon survey data and literature review, the Top 5 items were identified. These items focused on testing for antinuclear antibodies, autoantibody panels, Lyme disease, methotrexate toxicity monitoring, and use of routine radiographs.

Conclusion. The ACR pediatric rheumatology Top 5 is one of the first pediatric subspecialty–specific Choosing Wisely Top 5 lists and provides an opportunity for patients and providers to discuss appropriate use of health care in pediatric rheumatology.

INTRODUCTION

In response to a challenge issued by the American Board of Internal Medicine (ABIM) Foundation as part of the Choosing Wisely campaign, the American College of Rheumatology (ACR) charged its Special Committee on Pediatric Rheumatology to create a Top 5 list of tests and treatments commonly used in pediatric rheumatology practice

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whose routine use, based upon available evidence, may add to the cost of care without improving quality of care. As the US struggles to reduce health care costs without jeopardizing quality of care, physician involvement is needed to develop strategies to reduce health care spending (1). In 2011, the ABIM Foundation launched the Choosing Wisely campaign, encouraging medical societies to identify sources of unnecessary spending. Partnering societies were charged with developing a Top 5 list of tests, treatments, or services commonly used by that specialty that have high aggregate costs and are unnecessary or potentially harmful. Recommendations were based on clinical guidelines and available evidence (2). The Top 5 lists are intended to be widely disseminated to physicians and patients, prompting discussions about the utility and optimal use of these tests and interventions (3). The Top 5 list aims to raise awareness of potentially wasteful interventions but not replace clinical judgment or individualized care, and each item includes information about when the test or procedure may be appropriate.

To date, 51 medical societies have participated in the Choosing Wisely campaign (3), and in March 2013, the ACR published a Top 5 list (4). Given the unique needs of the pediatric rheumatology population, the ACR supported the parallel development of this ACR pediatric rheumatology Top 5 list. This list is the product of a multistep process that included survey and consensus techniques and extensive literature reviews, ensuring that the final items reflect expert opinion and best available evidence.

MATERIALS AND METHODS

The ACR Special Committee on Pediatric Rheumatology was given the task by the ACR Board of Directors to develop the pediatric rheumatology Top 5 list, and members had no conflicts of interest. Guiding principles of the adult ACR Top 5 task force were adapted for this project: 1) items should be generated by a diverse selection of experienced, practicing pediatric rheumatology providers; 2) the process should attempt to involve the majority of the pediatric rheumatology community in North America; and 3) the final items should undergo literature review. The ACR adult rheumatology Top 5 results were under embargo and unavailable to the pediatric rheumatology Top 5 task force until after the data were collected and analyzed. The overall strategy of the process is shown in Figure 1 (4).

Phase 1: development of ideas. The special committee assembled a group of practicing pediatric rheumatology providers to generate candidate items for the Top 5 list. The special committee assembled a Core Membership Group of 18 pediatric rheumatology providers who were geographically distributed across North America.

Delphi survey round 1. The Core Membership Group was instructed that proposed items should meet these criteria: 1) commonly ordered or provided by pediatric rheumatology providers, pediatricians, and other practitioners who evaluate children with musculoskeletal symp-
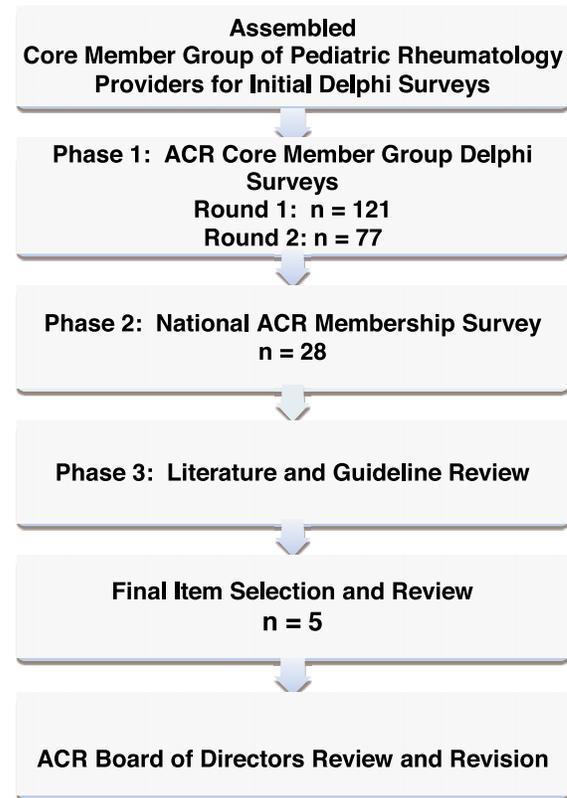

Figure 1. Flow diagram of methodology for developing the American College of Rheumatology (ACR) pediatric rheumatology Top 5 list. n = number of candidate items for the Top 5 list considered at each stage.

toms; 2) among the most expensive services ordered or provided (individually or in aggregate); and 3) shown by the best available evidence not to provide meaningful benefit to some of the groups for which the test or treatment is provided. The task force reviewed the responses and organized them into major domains. Items were edited into "Do not . . ." statements for use in the second round of the survey.

Delphi survey rounds 2 and 3. The Core Membership Group completed 2 additional rounds of web-based surveys, following the procedures used for the development of the ACR adult rheumatology Top 5 list (4). The proposed items were rated according to 4 attributes: content (agreement for inclusion in the list), prevalence (how common the item is an issue in pediatric rheumatology practice), aggregate cost, and harm potentially incurred by the practice. Five-point Likert scales were used to assess each attribute (i.e., for content, anchored from "strongly disagree" to "strongly agree"). Space was provided for comments, suggested revisions, or additional items. The list of candidate items was narrowed after each survey round based upon ratings. Similar candidate items were combined for use in the next round. In later survey rounds, participants ranked their top 10 items (by highest importance and if it was high impact or not). Ultimately, the highest-scoring items after the Core Membership Group survey process were included in a survey of the larger pediatric rheumatology community.

	Content agreement, raw mean ± SD†	Content disagreement, %‡	Impact, % with high impact rating§	Top picks, % ranking as 1st or 2nd choice
Autoantibody panels	4.33 ± 1.18	12	85	46
Lyme disease	4.60 ± 0.84	5	71	13
Surveillance joint radiographs	4.42 ± 0.86	4	53	4
Methotrexate toxicity labs	3.96 ± 1.26	18	57	3
Repeat ANA	4.22 ± 1.11	13	69	21

Table 1. National survey results for the American College of Rheumatology pediatric rheumatology Top 5 list (n = 397)*

* ANA = antinuclear antibody.
† Assessed on a 1–5 Likert scale, anchored from 1 = strongly disagree to 5 = strongly agree.
‡ Percentage of respondents who disagreed or strongly disagreed.
§ Assessed by asking respondents whether they thought the item was high impact (yes/no).

Phase 2: ACR member involvement. *ACR member survey.* An e-mail link to an anonymous survey using the methods described above was sent to all ACR members listing pediatric rheumatology as part of their practice, including US and international members.

Survey analysis. The survey results were analyzed by the task force and items with the highest scores in content agreement, impact, and rank underwent literature review. Respondent comments were used to edit the wording of the chosen items.

Phase 3: scientific evidence review. Special committee members performed in-depth literature reviews utilizing PubMed and other relevant sources. Evidence reports were prepared and submitted to the task force for review. Consensus was achieved on Top 5 items, specific wording, and supporting documentation. The finalized list and evidence reports were presented to the ACR Board of Directors for approval.

ACR Board of Directors' review. The ACR Board of Directors recommended combining 2 items pertaining to antinuclear antibody (ANA) testing into one statement, allowing inclusion of an additional item with a high impact rating. After performing the literature review, the special committee agreed and incorporated this change into the final Top 5 list. The revised Top 5 list was approved by the ACR Board of Directors on March 14, 2013.

RESULTS

Core Membership Group Delphi survey results. The first Delphi survey generated 121 unique items for the ACR Top 5 list. Due to overlap between similar items, this list was narrowed to 77 items, which were included in the second Delphi survey (see Supplementary Appendix A, available in the online version of this article at http:// onlinelibrary.wiley.com/doi/10.1002/acr.22238/abstract). Candidate items from the second survey with mean content agreement >3.7 (28 items) were included in the ACR member survey (see Supplementary Appendix B, available in the online version of this article at http://onlinelibrary. wiley.com/doi/10.1002/acr.22238/abstract).

ACR member survey results. Members surveyed included those who primarily practice pediatric rheumatology as well as adult rheumatology providers caring for children. Of the 1,198 ACR members who received the survey, 397 (33%) responded. The response rate was highest (52%) among respondents who described themselves as primarily pediatric rheumatology providers compared to 19% among adult rheumatology providers caring for pediatric patients. Among the respondents, 67% described their primary specialty as pediatric rheumatology or pediatrics, 26% are international, and 70% spent most of their time in patient care, 19% in research, and 11% in other activities. A comparison of pediatric and adult rheumatology providers' responses showed similar results and did not change the Top 5 items. For the top 28 items, content agreement was high (mean ± SD 4.01 ± 0.34, range 3.45–4.60). The ratings for the Top 5 items are shown in Table 1 and the final Top 5 items are shown in Table 2.

FINAL TOP 5 FOR PEDIATRIC RHEUMATOLOGY

A complete summary of the literature review is beyond the scope of this article, but key findings are summarized below. A modified version of the Grading of Recommendations Assessment, Development and Evaluation system was used to determine the strength of the evidence (category 1 = strong, category 2 = weak) and the quality of the evidence (grade A = high, grade B = moderate, grade C = low) for each literature review (5).

1. Do not order autoantibody panels unless positive ANAs and evidence of rheumatic disease

Rationale. There is no evidence that autoantibody panel testing in the absence of history or physical examination evidence of rheumatic disease enhances the diagnosis of children with isolated musculoskeletal pain. Autoantibody panels are expensive, and cost savings can be achieved by limiting autoantibody panel testing. Autoantibody panels should only be ordered following confirmed ANA positivity (preferably done by immunofluorescence assay/immunofluorescence assay [IFA] method) or when clinical suspicion for rheumatic disease is high (6–11).

Level of evidence. Grade 1B.

Table 2. The American College of Rheumatology pediatric rheumatology Top 5 list*

Do not order autoantibody panels unless positive ANAs and evidence of rheumatic disease.†
    There is no evidence that autoantibody testing (including ANA and autoantibody panels) enhances the diagnosis of children with musculoskeletal pain in the absence of evidence of rheumatic disease as determined by a careful history and physical examination.

Do not test for Lyme disease as a cause of musculoskeletal symptoms without an exposure history and appropriate examination findings.
    Musculoskeletal manifestations of Lyme disease include acute arthralgias or intermittent or persistent episodes of oligoarthritis, usually including the knee. Lyme testing without these clinical features increases the likelihood of false-positive results, leading to unnecessary antibiotic exposure and unnecessary clinic visits. Chronic diffuse arthralgias or myalgias are not suggestive of Lyme disease.

Do not routinely perform surveillance joint radiographs to monitor JIA disease activity.
    No available data suggest that routinely obtaining surveillance joint radiographs to monitor for the development or progression of erosive changes in children with JIA improves outcomes. Therefore, obtaining routine joint radiographs would lead to radiation exposure without any clear benefit.

Do not perform methotrexate toxicity labs more often than every 12 weeks when patients are on stable doses.
    Laboratory abnormalities in children taking methotrexate are usually mild and rarely prompt significant changes in management. Screening low-risk children every 1–2 months may lead to unnecessary interruptions in treatment and contributes to higher cost of care. More frequent monitoring is required in the first 6 months after methotrexate initiation, following dose escalation, and in the long term in patients with risk factors for toxicity (obesity, diabetes mellitus, renal disease, systemic JIA, macrophage activation syndrome, Down syndrome, alcohol use, or concomitant use of hepatotoxic or myelosuppressive medications).

Do not repeat a confirmed positive ANA in patients with established JIA or SLE.
    ANA positivity is important in SLE diagnosis and positivity guides frequency of slit-lamp examination for JIA uveitis screening. Beyond this, there is no evidence that ANA testing is valuable in the ongoing management of either disease. It is recommended that following diagnosis of SLE or JIA, ANA should not be repeated unless a child with JIA has symptoms suggestive of an evolving ANA-associated autoimmune disease.

* ANA = antinuclear antibody; JIA = juvenile idiopathic arthritis; SLE = systemic lupus erythematosus.
† Several laboratories offer rheumatology or autoantibody panels, including extractable nuclear antigens, which may include anti-Sm, anti-RNP, anticentromere, anti–Scl-70, anti-SSA/Ro, anti-SSB/La, anti–Jo-1, anti–PM-1, as well as testing for anti–double-stranded DNA and antihistone antibodies. We chose the term "autoantibody panel" to encompass all possible batteries of multiple autoantibody tests employed for the evaluation of ANA-associated rheumatic disease.

Related guidelines. In the Effective Health Care Program of the Department of Health and Human Services, use of ANA for evaluating musculoskeletal symptoms in children was assessed. The authors concluded that ANA testing in children presenting with undiagnosed musculoskeletal pain did not add diagnostic utility in diagnosing juvenile idiopathic arthritis (JIA) or systemic lupus erythematosus (SLE). The conclusion was that rheumatology serologies should be used as adjuncts to diagnosis only if there is clinical concern for an inflammatory process (6). Here, the term "autoantibody panel" is used to encompass all possible batteries of multiple autoantibody tests employed for the evaluation of ANA-associated rheumatic disease.

Literature review. Up to 50% of healthy children experience musculoskeletal pain, and most children with musculoskeletal symptoms do not have or develop inflammatory conditions. Evaluation of these patients often involves ANA and autoantibody panel assays. Cabral et al evaluated 108 pediatric patients with noninflammatory musculoskeletal pain and positive ANA over a mean of 61 months and concluded that there is a low risk of developing a rheumatic or autoimmune disease in the absence of clinical evidence of inflammatory disease (7). These findings

were supported by Deane et al in a series of 31 children with positive ANA (by IFA) and no initial diagnosis of autoimmune disease followed over approximately 3 years (8). Another study found that children referred because of a positive ANA (by IFA) were no more likely to be diagnosed with a chronic inflammatory disease than children who lacked this testing (9). These studies suggest that many children referred to pediatric rheumatology clinics for positive ANA will not be diagnosed with a rheumatic disease. More important in diagnosing these diseases are the history and physical examination. A recent review suggested that ANA testing in children should not be ordered for nonspecific symptoms such as musculoskeletal pain; if the child is otherwise well and the titer is <1:640, a positive ANA may be disregarded (10).

If ANA testing is negative, autoantibody panel tests are usually negative. Although rare in children, patients with Sjögren's syndrome can have a positive anti-SSA with negative ANA. A recent Canadian health system utilization review found that in a 2-year period, $862,707 was spent on autoimmune antibody testing and fewer than 17% of these tests were positive (11). Nearly half of anti–double-stranded DNA and extractable nuclear antigens were ordered simultaneously with ANA, and often the ANA was negative. An algorithm was developed in which

specific autoantibody testing was canceled if ANA was negative, resulting in 30% cost savings. While these tests can be useful in pediatric rheumatic disease, they should be obtained only when history and physical examination suggest an autoimmune process.

2. Do not test for Lyme disease as a cause of musculoskeletal symptoms without an exposure history and appropriate examination findings

Rationale. Musculoskeletal manifestations of Lyme disease include acute arthralgias or intermittent or persistent episodes of oligoarthritis, usually including the knee. Lyme is most likely to occur in patients who live in or have traveled to endemic areas. Lyme testing without these clinical features increases the likelihood of false-positive results, unnecessary followup, and antibiotic administration. Chronic diffuse arthralgias or myalgias are not suggestive of Lyme disease (12–16).

Level of evidence. Grade 1A.

Related guidelines. The Centers for Disease Control and Prevention (CDC), the American College of Physicians (ACP), and the Infectious Diseases Society of America (IDSA) have published recommendations for diagnostic testing in Lyme disease (12,14).

Literature review. Early Lyme disease is characterized by erythema migrans, and the diagnosis can be established without serologic testing if this manifestation is present. However, many pediatric patients present later in the disease and require laboratory testing for diagnosis. Despite the CDC, ACP, and IDSA guidelines, pitfalls remain in the laboratory evaluation of Lyme disease. An evaluation of 216 children referred to a tertiary care center for Lyme disease in an endemic area found that only 31% met the CDC criteria (15). The incorrect diagnosis of Lyme disease in the remaining 69% of patients led to overuse of antibiotics. This adds unnecessary medication costs, potential for antibiotic resistance, and patient/family anxiety. Overdiagnosis was usually due to misinterpretation of Lyme serologies.

The ACP recommends a 2-tier immunologic evaluation. If the initial enzyme-linked immunosorbent assay (ELISA) or IFA test is negative, no further testing is needed. If the ELISA or IFA is positive or indeterminate, Western blotting should be performed. The diagnosis of Lyme disease requires 2 of 3 IgM bands (21 kd [OspC]/24 kd; 39 kd [BmpA]; 41 kd [Fla]) or 5 of 10 IgG bands (18 kd; 21 kd [OspC]/24 kd; 28 kd; 30 kd; 39 kd [BmpA]; 41 kd [Fla]; 45 kd; 58 kd; 66 kd; 93 kd) (13).

An overlooked criterion is that the patient either lives in or has traveled to an area endemic to Lyme disease. In fact, Ley et al reported that Lyme serologies were appropriately ordered in <10% of cases in a nonendemic area (16). The CDC does maintain an interactive map of Lyme disease and endemic areas are gradually increasing (http://www.cdc.gov/lyme/stats/maps/interactivemaps.html). Despite this, Lyme serologies are often obtained in a patient without an appropriate exposure history, contributing to inap-propriate health care expenditure. Adding to this unnecessary cost is the media coverage of Lyme disease, which prompts parents and families to request unnecessary testing.

3. Do not routinely perform surveillance joint radiographs to monitor JIA disease activity

Rationale. No available data suggest that routinely obtaining surveillance joint radiographs to monitor for the development or progression of erosive changes in children with JIA improves outcomes. Radiation exposure is a potential risk. In the absence of data to support clear benefit, radiographs should be obtained by the pediatric rheumatologist only when history and physical examination raise clinical concern about joint damage or decline in function (17–35).

Level of evidence. 2C.

Related guidelines. The 2011 ACR recommendations for the treatment of JIA mention radiographic damage as a poor prognostic factor, which may influence therapy decisions, but make no recommendations about use of routine radiographs in clinical practice (17). The British Society for Paediatric and Adolescent Rheumatology standards of care for children and young people with JIA indicate that patients with JIA should have radiology resources available for evaluation and management, but do not recommend specific followup radiographs for JIA (23). The Australian government's 2009 clinical guideline for the diagnosis and management of JIA recommends consideration of radiographs in the diagnosis of JIA, but do not include recommendations about routine serial radiographs in the management of JIA (24).

Literature review. Progressive erosive damage in affected joints is a key complication of JIA and predicts long-term joint damage and physical disability (18,20,29). In the adult rheumatology clinical trial setting, serial radiographs are used to assess structural damage to joints over time and to evaluate the effectiveness of therapeutic interventions. Similar surveillance radiographs are also obtained on a regular basis in clinical practice by some pediatric rheumatologists; data are not available concerning the prevalence of this practice.

Radiographic changes in JIA include soft tissue swelling, periarticular osteopenia, erosions, joint space narrowing, subcortical cysts, and a shortened carpal to metacarpal joint ratio (22). Radiographic findings can be quantified using the adapted Sharp/van der Heijde (30) or Djikstra (31) radiograph scoring systems and the Poznaski score (for carpal to metacarpal joint ratio) (32), but these scores are tedious to perform and require substantial experience for accurate measurement, and therefore are primarily used in research settings (33). Serial radiographs obtained in clinical practice often include primarily qualitative information that limits direct comparisons. Other limitations include challenges in assessing changes in the developing skeleton and absence of information about synovitis. Monitoring hand/wrist radiographs may miss other joint in-

volvement, and assessment of all involved joints increases radiation exposure and cost. With the advent of more aggressive early therapy in JIA, and with the widespread use of therapies with a biologic agent in particular, progression of radiographic damage has fortunately slowed for many JIA patients (29,34,35).

Data are lacking concerning the safety, cost-effectiveness, and impact on outcomes concerning use of routine radiographs in the clinical care of adults with rheumatoid arthritis (RA) as well. Most adult RA guidelines discuss periodic radiographic evaluation of affected joints, but most do not specify time intervals (26,36). The Arthritis Foundation's quality indicator set recommends obtaining radiographs of the hands and feet at baseline and every 3 years; however, a literature review examining the evidence basis for these recommendations found no evidence to support this recommendation (28). In a 2005 Canadian study assessing adherence to the 2002 ACR recommendations for management of RA, only 10% of patients had radiographs performed periodically to assess disease activity (37).

Potential risks of surveillance radiographs include radiation exposure. The radiation exposure associated with a single wrist radiograph is small, approximately 0.01 mSv (19). Available data suggest that cumulative childhood radiation exposure up to 49 mSv is not associated with cancer risk (38). No studies have addressed the cost-effectiveness of obtaining routine surveillance radiographs in JIA.

4. Do not perform methotrexate toxicity labs more often than every 12 weeks when patients are on stable doses

Rationale. Laboratory abnormalities in children taking methotrexate are usually mild and rarely prompt significant changes in management. Screening low-risk children every 1–2 months may lead to unnecessary interruptions in treatment. More frequent monitoring may be required in the first 6 months after methotrexate initiation, following dose escalation, and in patients with risk factors for toxicity (obesity, diabetes mellitus, renal disease, systemic JIA, macrophage activation syndrome, Down syndrome, alcohol use, or concomitant use of hepatotoxic or myelosuppressive medications) (17,36,39–44).

Level of evidence. Grade 1B.

Related guidelines. The 2011 ACR recommendations for the treatment of JIA suggest screening for drug toxicity every 3–4 months for patients taking stable doses of methotrexate, and more frequently immediately following drug initiation and dose escalation (17). The ACR 2008 recommendations for the use of nonbiologic and biologic disease-modifying antirheumatic drugs in RA recommended laboratory screening for methotrexate toxicity every 2–4 weeks in the first 3 months after drug initiation or dose escalation, every 8–12 weeks from months 3–6, and every 12 weeks thereafter (36).

Literature review. Hepatotoxicity and bone marrow suppression are rare in children taking long-term methotrexate for JIA (39–41,45). Previous guidelines for monitoring methotrexate toxicity in adults included laboratory testing every 4–8 weeks; however, updated recommendations advocate less frequent screening in patients who have tolerated a stable dose of methotrexate for more than 6 months (36). The most recent JIA treatment guidelines similarly recommended less frequent laboratory monitoring in children receiving stable doses of methotrexate (17).

Children with JIA usually lack the additional comorbidities and risk factors for methotrexate toxicity often present in adults. Laboratory abnormalities in children taking long-term methotrexate for JIA are typically mild and transient, and often resolve without specific intervention (43,44). The rationale for frequent laboratory monitoring is to allow early identification of patients at risk for liver damage; however, significant liver fibrosis is an exceedingly rare event in children taking methotrexate for JIA, and cirrhosis has not been described in the literature in this patient population. Transaminase elevations on routine laboratory evaluation rarely prompt referral for liver biopsy or change in treatment (43,44). Patients with identifiable risk factors for toxicity may warrant more frequent monitoring (43,44).

5. Do not repeat a confirmed positive ANA in patients with established JIA or SLE

Rationale. ANA positivity is important in SLE diagnosis, and positivity guides frequency of slit-lamp examination for JIA uveitis screening. Beyond this, there is no evidence that ANA testing is valuable in the ongoing management of either disease. It is recommended that following diagnosis of SLE or JIA, ANA should not be repeated unless a child with JIA has symptoms suggestive of an evolving ANA-associated autoimmune disease (46–48).

Level of evidence. Grade 1C.

Literature review. ANA positivity varies among the subclasses of JIA, with the highest prevalence of up to 85% in children with oligoarthritis (46). Although not a criterion for the diagnosis of JIA, ANA positivity has prognostic significance for uveitis, and the American Academy of Pediatrics has published uveitis screening guidelines based on ANA status at diagnosis (48,49). There may be utility in confirming ANA status in a patient with a single positive or negative test. However, there is no evidence to support the utility of serial ANA testing to monitor JIA disease activity. Exceptions may arise; for example, if a child with JIA has evolution of symptoms to suggest SLE.

The ACR revised classification criteria for SLE (50), which were updated in 1997 (51), include an abnormal titer of ANA. Although these classification criteria were validated in adults, the criteria are often used for diagnosis in pediatric SLE (47). More than 95% of patients with SLE are ANA positive. There are no data to support the utility of serial ANA testing to monitor SLE disease activity.

DISCUSSION

Fifty-one medical societies have participated in the ABIM Choosing Wisely campaign and released Top 5 lists. Although most of these lists relate to adult medicine, the American Academy of Pediatrics and the Society of Hospital Medicine/Pediatric Hospital Medicine issued Top 5 lists in 2013 (3). The ACR published their Choosing Wisely Top 5 list in March 2013 (4). Since these recommendations may not be applicable to pediatric rheumatology, we used a similar but independent evidence-based approach involving physicians managing pediatric rheumatology patients.

The ACR Special Committee on Pediatric Rheumatology created this Top 5 list without prior knowledge of the adult rheumatology Top 5 categories. Although many differences exist in the management of adult versus pediatric rheumatology patients, 2 of the 5 recommendations were similar. Autoantibody testing can be useful in the appropriate clinical setting; however, both adult and pediatric rheumatologists caution against indiscriminate autoantibody testing. If the history and examination suggest a possible rheumatologic condition, initial ANA testing is reasonable. If this is negative, further antibody testing is usually unnecessary. Similarly, rheumatoid factor testing in a child with musculoskeletal pain has little diagnostic utility in the absence of objective signs of rheumatic disease (6). The second category that was included in both the adult and pediatric Top 5 lists concerned evaluation of Lyme disease. Certainly, musculoskeletal involvement in Lyme disease occurs, but there should be exposure in a Lyme-endemic area and/or history and physical examination findings to support this diagnosis. Lyme antibody serologies may be falsely positive, prompting further costs and patient concern.

As noted by the adult ACR Top 5 authors, clinical judgment and individualized decision making remain critical to patient management. In no way does this Top 5 list replace a practitioner's clinical judgment, since each patient should be cared for individually. It must also be made clear that these Top 5 items may not be generalizable to other areas of the world. Our literature review identified the need for further research in certain areas, including the role of serial radiographs in JIA.

Ultimately, the mission of this study was for the ACR to participate in the Choosing Wisely campaign of the ABIM Foundation and provide a pediatric rheumatology Top 5 list to medical authorities and the public. With the advance of technology, in particular the internet, patients and families have access to medical information that was not readily available to them 20 years ago. Some families may request or even demand costly testing that may not be in the best interest of the patient. As indicated by the adult rheumatology Top 5 article, upholding patient autonomy is part of our professional code as physicians (4). Thoughtful conversation between the patient, family, and provider is enhanced by the Choosing Wisely campaign; ultimately, this will enrich their care while optimizing cost.

Pediatric rheumatology is a small subspecialty, and by necessity, some adult rheumatologists manage pediatric rheumatic disease. Our final survey was distributed to all adult and pediatric rheumatology providers who reported managing pediatric patients. Approximately 36% of the respondents identified themselves as adult rheumatologists. As noted above, further analysis of the survey responses showed no substantial differences between adult and pediatric rheumatology providers.

The Choosing Wisely pediatric rheumatology Top 5 list should foster productive discussion between physicians, patients, and their families. Although focused on providers practicing pediatric rheumatology, the overutilization of these tests extends beyond specialty care to include general practitioners, family practitioners, pediatricians, and midlevel providers. Therefore, we anticipate that this list may also promote dialog between the pediatric rheumatology community and primary care physicians, further enhancing the care of our patients while attempting to minimize cost. Similar to our adult rheumatology colleagues, we were inspired by the enthusiasm displayed throughout the survey process, highlighting the fact that all pediatric rheumatology providers desire the highest quality of care while optimizing resource utilization in patient care.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Dr. Ferguson had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study conception and design. Ardoin, Becker, Kolba, Nigrovic, Ferguson.
Acquisition of data. Rouster-Stevens, Cooper, Dragone, Kolba, Moorthy, Nigrovic, Stinson, Ferguson.
Analysis and interpretation of data. Rouster-Stevens, Ardoin, Cooper, Dragone, Huttenlocher, Jones, Kolba, Moorthy, Nigrovic, Stinson, Ferguson.

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APPENDIX A: ADDITIONAL MEMBERS OF THE AMERICAN COLLEGE OF RHEUMATOLOGY PEDIATRIC RHEUMATOLOGY CORE MEMBERSHIP GROUP

Additional members of the American College of Rheumatology Pediatric Rheumatology Core Membership Group are as follows: Robert Colbert, Randy Cron, Peter Dent, Melissa Elder, Donald Goldsmith, J. Roger Hollister, Norman Ilowite, Yukiki Kimura, Marisa Klein-Gitelman, Erica Lawson, Murray Passo, Ross Petty, Marilynn Punaro, Egla Rabinovich, Andreas Reiff, David Sherry, Robert Sundel, and Laurence Zemel.