

2026 Clinical Practice Guideline Update by the Infectious Diseases Society of America and the Pediatric Infectious Diseases Society on The Management of Community-Acquired Pneumonia in Infants and Children Older than 3 Months of Age: The Use of Pleural Fluid Drainage versus Observation

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ABSTRACT.

This paper is part of a larger clinical practice guideline on the diagnosis and management of parapneumonic effusion and empyema in children, developed by the Infectious Diseases Society of America. In this paper, the panel provides recommendations for pleural fluid drainage in children (3 months to 18 years) with parapneumonic effusion and empyema. The panel's recommendations are based upon evidence derived from systematic literature reviews and adhere to a standardized methodology for rating the certainty of evidence and strength of recommendation according to the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach.

Key words. Pneumonia, parapneumonic effusion, empyema, thoracentesis

In children (3 months to 18 years of age) with parapneumonic effusion, is pleural fluid drainage more beneficial than observation?

Recommendation: In children with small, uncomplicated parapneumonic effusions, the IDSA panel suggests observation over pleural drainage (*conditional recommendation, very low certainty of the evidence*).

Remark(s):

- For children with large or complicated effusions or with hemodynamic instability, early pleural drainage is recommended

A **strong** recommendation means most informed people would choose the recommended course of action and only a small proportion would not. A **conditional** recommendation means the majority of informed people would choose the suggested course of action but many would not.

INTRODUCTION

Decisions regarding the management of pleural fluid should be considered in context, including the patient's clinical status, radiographic imaging, and laboratory results. The magnitude and severity of lung parenchymal disease rather than the size of the effusion is often the primary driver of illness. Additionally, management of the pleural effusion needs to be addressed in the context of systemic disease (e.g. sepsis) and may improve oxygenation and respiratory dynamics among children with large effusions.

This paper is part of a larger clinical practice guideline on the diagnosis and management of parapneumonic effusion and empyema in children, developed by the Pediatric Infectious Diseases Society (PIDS) and the Infectious Diseases Society of America (IDSA), and has been the Pediatric Infectious Diseases Society (PIDS).

In this paper, the guideline panel provides recommendations for the use of pleural fluid drainage procedures in the management of children with parapneumonic effusion and empyema. These recommendations replace previous statements in the last iteration of this guideline [1, 2]. These recommendations are intended for use by healthcare professionals who care for patients with complicated parapneumonic effusion and empyema.

METHODS

The panel's recommendation is based on evidence derived from a comprehensive systematic literature review and adheres to a standardized methodology for rating the certainty of evidence and strength of recommendation according to the GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach [3]. The recommendations are labeled as "strong" or "conditional" according to an evaluation of the certainty of evidence, the balance between benefits and harms, patients' values and preferences, resources/cost, and other factors such as acceptability, feasibility, and equity. More details about the systematic review and guideline development processes are presented in the Supplementary Material.

A comprehensive literature search (through August 2024) was conducted as part of a systematic review. Key eligibility criteria at both the topic and clinical question levels guided the search and selection of studies for inclusion. For this question, the panel considered patients 3 months to 18 years of age with complicated parapneumonic effusion defined as empyema, undergoing pleural drainage procedures or observation. Studies with patients receiving antibiotics alone compared to undergoing a drainage procedure were included. Studies with adult populations were excluded, as well as international populations in resource-limited areas. Randomized controlled trials and observational studies were screened for inclusion.

Included studies were assessed for risk of bias using the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-1) tool [4]. Where applicable, study outcome data were pooled via meta-analysis using the random effects model using RevMan [5].

Included studies underwent critical appraisal according to the GRADE approach. An assessment of the benefits and harms of care options informed the recommendation(s) [3]. Details of the systematic review and guideline development processes are available in the Supplementary material.

SUMMARY OF EVIDENCE

A comprehensive literature search identified three observational studies that met the panel's inclusion criteria [6-8]. Carter et al. reviewed 182 children hospitalized with pneumonia and pleural effusions. A total of 87 of these children underwent a drainage procedure, while 95 were managed with observation [6]. Similarly, Goldin et al retrospectively reviewed 14,936 patients <18 years old who had a diagnosis of empyema or pneumonia and pleural effusion. Patients underwent either a drainage procedure or were treated with antibiotics alone [7]. Segerer et al evaluated 649 pediatric patients with parapneumonic effusion or pleural empyema receiving either an invasive procedure (i.e drainage catheter, fibrinolytic therapy, surgical procedure) or observation alone as treatment [8]. A majority of patients included (49%) presented with small, uncomplicated parapneumonic effusions.

Two studies examined length of stay following pleural drainage procedures compared with observation alone [6, 8]. Combined data from these studies demonstrated that observation alone was associated with shorter length of hospital stay (mean difference -4.65 days; 95% CI -3.87 to -5.43) but a similar mortality rate compared with pleural drainage (3.1% vs 3.3%, RR 0.93; 95% CI 0.78-1.11) [7]. However, fluid drainage was associated with a reduced need for subsequent procedures compared to observation alone (26.2% vs. 45.0%; RR 1.71; 95% CI 1.38-2.13) [8].

The overall certainty of evidence for the reported outcomes is low due to imprecision related to the small sample size and corresponding wide 95% confidence intervals. Refer to the Supplementary Material for the GRADE Evidence Profiles which detail the exact judgments affecting certainty of evidence for each outcome.

RATIONALE FOR RECOMMENDATION(S)

Given the results of the included studies, the panel conditionally recommends observation alone over drainage in children with small parapneumonic effusions. The panel considered costs, resources required and feasibility and determined that that these would probably favor the comparator.

Pleural drainage should be performed in children with large effusions. In these children, infection of the lung parenchyma, systemic response to infection, and a space occupying process around the lung may contribute to hemodynamic and respiratory instability.

IMPLEMENTATION CONSIDERATIONS

Observation in this patient population is easy to implement. Patients typically receive antibiotics, which are readily available. The panel did not identify any issues related to implementation.

RESEARCH NEEDS

Further investigations are needed to help determine the clinical characteristics and radiographic features that identify patients who would benefit from pleural fluid drainage.

Acknowledgments: First, the panel would like to acknowledge the previous panel, under the leadership of John Bradley, for their work on the previous iteration of this larger guideline. The panel would like to acknowledge the contributions of Elena Guadagno, medical librarian, for the creation and execution of PICO-specific literature search(es). Rebecca Goldwater and Loretta Dzanya provided project coordination. The panel would also like to acknowledge the following organizations and selected external reviewers for their review of the draft manuscript: the American Academy of Pediatrics (AAP), the Pediatric Infectious Diseases Society (PIDS), Drs. Annabelle De St. Maurice, Jason Newland, Nanda Ramchandar, Pranavi Sreeramoju, and Surabhi (Sara) Vora.

Samir S. Shah is chair of the pediatric CAP guideline panel. Mark Neuman is the vice-chair of the panel. Shawn St Peter and Krow Ampofo served as clinical leads for the questions addressed in this manuscript. Remaining panelists assisted with conception and design of the analysis, interpretation of data, drafting and revising the recommendations and manuscript, and final approval of the recommendations and manuscript to be published. Nigar Sekercioglu and Sheena Patel, methodologists, were responsible for general project management, designing and performing the systematic review, and leading the panel according to the GRADE process.

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Possible conflicts of interest. Evaluation of relationships as potential conflicts of interest is determined by a review process. The assessment of disclosed relationships for possible COIs is based on the relative weight of the financial relationship (i.e., monetary amount) and the relevance of the relationship (i.e., the degree to which an association might reasonably be interpreted by an independent observer as related to the topic or recommendation of consideration). The following panelists have reported relationships with the indicated companies since 2018, when guideline development began; these relationships are **unrelated to the topic of community-acquired pneumonia (CAP)**. **K.K.A.** served as a scientific advisor for Merck; served as an advisor for Janssen Pharmaceuticals; received research funding from the National Institute of Allergy and Infectious Diseases (NIAID), the Centers for Disease Control and Prevention (CDC), and the State Government of Utah; receives research funding from Merck. **M.D.C.** served as an advisor for BioGaia, Thermo Fisher, Genentech, Novartis, and Nestlé; engaged in activities with the International Scientific Association for Probiotics and Prebiotics (ISAPP); served as a member of the U.S. Preventive Services Task Force (USPSTF); served as chair of the American Academy of Pediatrics Committee on Pediatric Research; received research funding from the Agency for Healthcare Research and Quality (AHRQ). **C.E.** served as an advisor for Sanofi, Janssen Pharmaceuticals, and Gilead; received honoraria from Sanofi, Astellas, the Kentucky Rural Health Association and Medavera for collaboration on the writing and publication of a manuscript addressing the use of molecular techniques in respiratory infections; received research funding from AstraZeneca, Merck, Enanta Pharmaceuticals, Clinetic, the National Institutes of Health (NIH), Melinta Therapeutics, Novavax, and Moderna; receives research funding from AHRQ, the Florida Department of Health, and CDC; serves as a member of the American Academy of Pediatrics Committee of Infectious Diseases and as a Board Director (District III) for the AAP Florida Chapter. **T.A.F.** received honoraria from DiaSorin and Medscape/WebMD; served in editorial roles with Pediatric Research and Pediatric Emergency Care; served as a council member for the Society for Pediatric Research; received research funding from the National Heart, Lung, and Blood Institute (NHLBI) and the Patient-Centered Outcomes Research Institute (PCORI); served as strategy and operations officer for the Society for Pediatric Research; serves on the Pediatric Academic Societies Board of Directors. **J.S.G.** received research funding from AHRQ, NIH,

CDC, and PCORI. **M.G.** served as president of the Society for Pediatric Research; served as a member of the Society for Pediatric Research Board of Directors; served as a member of the Pediatric Academic Societies Board of Directors; served as ambassador for North American Regional Societies for the Society for Pediatric Research; receives research funding from NIAID; receives research funding from the St. Louis Children's Hospital Foundation. **D.L.P.** received royalties from UpToDate; received honoraria from the American Academy of Pediatrics: Pediatrics Review and Education Program (PREP) for Infectious Diseases, JAMA Pediatrics, and UpToDate; received honoraria from Lurie Children's Hospital and the American Medical Association (AMA); received research funding from AHRQ and the Pew Charitable Trusts; owned intellectual property from Elsevier; served as associate editor for the Journal of the Pediatric Infectious Diseases Society (JPIDS) and the American Academy of Pediatrics PREP ID; serves on the Pediatric Infectious Diseases Society (PIDS) Board of Directors and Executive Committee; serves as president of PIDS. **M.S.** received research funding from the County of San Diego Health and Human Services Agency. **A.M.S.** received research funding from PCORI, the Children and Youth with Special Health Care Needs National Research Network (CYSHCNet), and the Gerber Foundation; reported a family relationship in which a spouse served as a consultant for echocardiography study interpretation for the Midwest Cardiovascular Research and Education (MCORE) Foundation. **D.J.W.** received research funding from AHRQ and NIH for work related to the Seattle-based Pediatric Health Information Partnership (P-HIP) initiative aimed at improving pediatric mental health care; serves on the Executive Council for the Pediatric Research in Inpatient Setting (PRIS) Network; serves on the Editorial Board for the Journal of Hospital Medicine; receives research funding from AHRQ and NIH. **S.S.S.** served in editorial roles with JAMA Pediatrics for the American Medical Association; served as senior deputy editor and then editor-in-chief for the Journal of Hospital Medicine for the Society of Hospital Medicine; served as associate editor for the Journal of the Pediatric Infectious Diseases Society; served as a Committee on Infectious Diseases member for the American Academy of Pediatrics; served as vice-chair for Pediatric Research in Inpatient Settings; received honoraria from the Society of Hospital Medicine; received research funding from NIAID, NHLBI, PCORI, and the Ohio Department of Public Health. **M.N.** served as associate editor for Pediatrics for the American Academy of Pediatrics; received research grants from Harvard University; serves as Co-Editor-in-Chief of Pediatric Emergency Care; receives honoraria from Wolters Kluwer for editorial roles with UpToDate and Pediatric Emergency Care; provides medical expert consultation, including medical record review and expert testimony in legal cases for law firms on issues not related to pneumonia.

The following panelists have reported relationships with the indicated companies since 2018, when guideline development began; these relationships are **related to the topic of community-acquired pneumonia (CAP)**. **K.K.A.** served in advisory roles involving patient enrollment for clinical trials with Johnson & Johnson and Merck related to lumicitabine, tedizolid, ceftolozane/tazobactam, and bezlotoxumab (all such relationships are no longer active). **D.L.P.** served on a data safety monitoring board for Pfizer for a trial related to azithromycin; received honoraria from Medscape related to an educational podcast (relationship ended in 2024); owns intellectual property related to educational materials for Elsevier; receives other remuneration from the AMA. **D.J.W.** received research funding from NIH/NIAID for work related to Vanderbilt/ICE-CAP/R01AI125642 and Vanderbilt/VTEU/HHSN272201300023I, CDC for work related to Vanderbilt/NVSN/U01IP001063 and AHRQ for work related to R01HS029331, the Reducing Overuse of Antibiotics with Decision Support (ROADS) study aimed at testing the safety and effectiveness of clinical decision support to promote antibiotic stewardship in lower respiratory tract infections in children; received in-kind research support from bioMérieux for procalcitonin assays related to CAP decision-making (this relationship is no longer active); reported a family relationship in which a spouse is employed by Pfizer and the funds are paid directly to them. **M.N.** served as a member of the Guideline Development Group of the World Health Organization for the Diagnosis and Management of Pneumonia and Diarrhea in Children. **All other authors reported no disclosures.**

Additional Information: More detailed information on the analysis and development of recommendations is available in the Supplementary file.

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