Complicated Pneumonia-Empyema Pathway v3.0:
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Stop and **Review**

Inclusion Criteria

- Children with diagnosis of pneumonia and suspected or confirmed parapneumonic effusion (PPE)/Empyema
  AND
- Plan for admission
  AND
- CXR effusion >10mm **or** > 1/4 hemithorax

Exclusion Criteria

- Cystic Fibrosis
- Trauma
- Recent thoracic surgery or infection

Complicated Pneumonia-Empyema Care

Appendix

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Antibiotic Selection:

Management of MRSA coverage among empyema patients

First Line:

- Ceftriaxone AND clindamycin
- If suspect clindamycin-resistant MRSA or critically ill, then substitute linezolid for clindamycin
- If allergic to ceftriaxone, then substitute ampicillin-sulbactam
- If allergic to clindamycin, then substitute trimethoprim-sulfamethoxazole (PO or IV)

Initial Work-Up:

- Blood Culture, CBC w diff, CRP, Coags, PIV, Chest US and start appropriate IV Antibiotics
- Consult Pulmonary and Infectious Diseases
- If ED teams are considering drainage, call consultants in ED; if no drainage, admitting (floor) team can call consultant

Recommend Drainage If Any of the Below:

- Complete white out of hemithorax and US that confirms effusion
- Moderate or large effusion (without complete white out of hemithorax), with severe respiratory distress (defined as need for HFNC, CPAP, BiPAP or intubation)
- Mediastinal shift on CXR

Recommend IV Antibiotics without Drainage if Any of the Below Apply:

- Small, moderate or large (without complete white out of hemithorax) effusion without severe respiratory distress, **and without** mediastinal shift
- Suspect necrotizing pneumonia or pulmonary abscess (based on clinical suspicion of air-fluid levels on CXR); if suspected, recommend chest CT with contrast

Consider drainage if signs of clinical worsening

Is the patient meeting clinical criteria for improvement?

Drainage procedure chosen by team consensus:

1. Preferred option: US guided chest tube placement by IR with fibrinolytics (tPA BID x 4 doses)
2. Video-assisted Thoracoscopic Surgery (VATS)

Recommend Pleural Fluid Studies (culture, cell count, LDH, glucose, bacterial PCR)
Continue IV antibiotics

NO, consider drainage

After 48 hours, if the following clinical criteria are not met, recommend drainage:

1. Improving appetite
2. Decrease in chest pain
3. Decrease in O2 support from admission (as applicable) AND decrease in tachypnea/work of breathing
4. Downtrending CRP (if re-checked)

Worsening

Improving

- Repeat tPA BID x 4 doses (not indicated after VATS; follow surgery recs)
- Repeat chest US, CBC diff, CRP

Improving

Discontinue chest tube if drainage <2 ml/kg/12 h for 24h
AND no air leak

Improving

Yes, assess for discharge

Worsening

Consultants and Primary Team Huddle

Discharge Criteria

- Clinically improved (pain resolved or improving, and well-managed)
- Off oxygen x 12 hours
- Tolerating full PO
- Fever curve downtrending x 24 hours
- CRP downtrending (if re-checked)

Discharge Instructions

Change to oral antibiotics at discharge/discuss antibiotic choice with ID

If no drainage procedure:

- 14 days from admission for mild/moderate disease
- 21 days from admission for severe disease

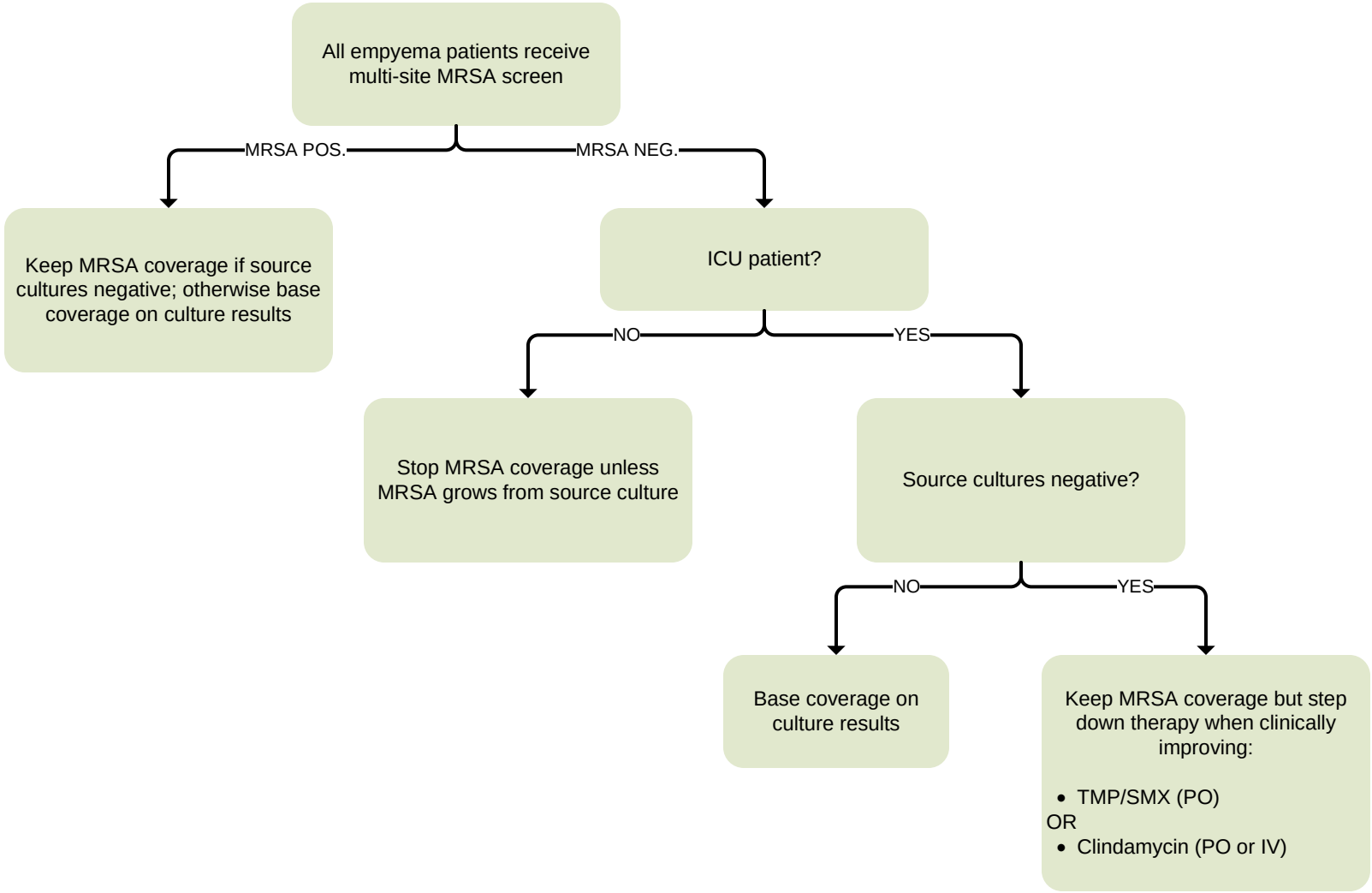
If drainage procedure:

- 14 days of date of drainage
- Follow up with PCP in 1 week; pulmonary and/or surgery in 2 months
- Provide patient/family with radiology images
- Recommend flu shot before discharge (if indicated)

Last Updated: April 2024
Next Expected Review: November 2023

For questions concerning this pathway, contact:
ComplicatedPneumoniaEmpyemaPathway@seattlechildrens.org

Complicated Pneumonia-Empyema Pathway v3.0:
Management of MRSA Coverage Among Empyema Patients



Summary of Version Changes

- **Version 1.0 (11/26/2018):** Go live.
- **Version 2.0 (9/15/2020):** Rename pathway from Empyema Pathway to Complicated Pneumonia Empyema Pathway; redesign Algorithm to clarify drain/no drain decision process, timelines, and roles.
- **Version 2.1 (1/7/2021):** MRSA Management link in Complicated Pneumonia Empyema Pathway algorithm corrected.
- **Version 2.2 (1/26/2023)**: Removed required surgical consult. Corrected the Approval & Citation and Bibliography pages.
- **Version 3.0 (4/26/2024)**: Removed vancomycin recommendation and replaced it with linezolid when anti-MRSA therapy is indicated per Antimicrobial Stewardship's new GOC.

Approval & Citation

Approved by the CSW Empyema team for November 26, 2018 go live

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Surgeon-in-Chief	Bob Sawin, MD

Retrieval Website: https://www.seattlechildrens.org/pdf/complicated-pneumonia-empyema-pathway.pdf

Please cite as:
Seattle Children's Hospital, Cogen J, Brothers A, Delos Reyes C, Goldin A, Groshong S, Haaland W, Hayes J, Hoffman L, Jerome M, Kazmier K, Kronman M, Migita D, Ohare P, Otero J, Redding G, Simmons K, Villavicencio C, 2024 April. Empyema Pathway. Available from: https://www.seattlechildrens.org/pdf/complicated-pneumonia-empyema-pathway.pdf

Evidence Ratings

This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children's. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94.):

Quality ratings are *downgraded* if studies:

- Have serious limitations
- Have inconsistent results
- If evidence does not directly address clinical questions
- If estimates are imprecise OR
- If it is felt that there is substantial publication bias

Quality ratings are *upgraded* if it is felt that:

- The effect size is large
- If studies are designed in a way that confounding would likely underreport the magnitude of the effect OR
- If a dose-response gradient is evident

Guideline – Recommendation is from a published guideline that used methodology deemed acceptable by the team.

Expert Opinion – Our expert opinion is based on available evidence that does not meet GRADE criteria (for example, case-control studies).

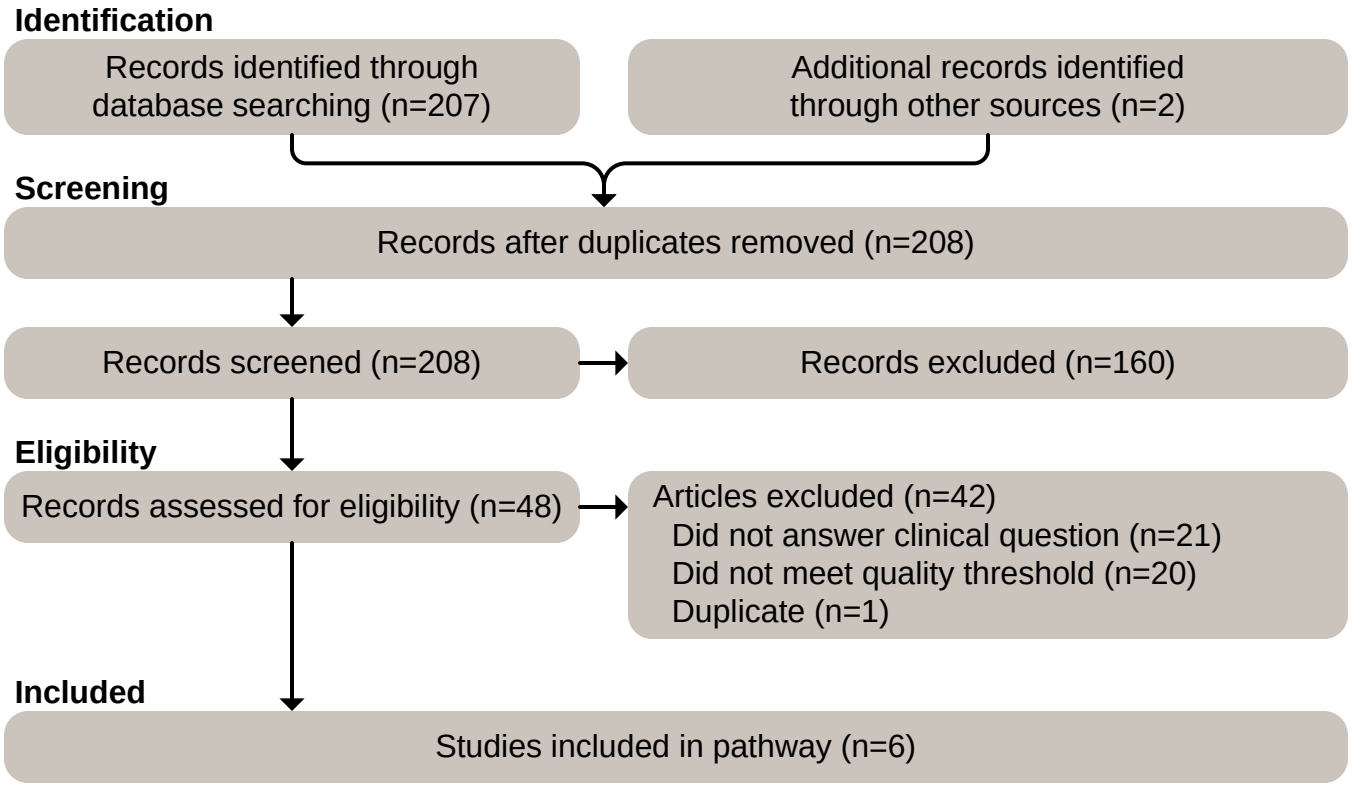
Certainty of Evidence

✪✪✪✪ High: The authors have a lot of confidence that the true effect is similar to the estimated effect
✪✪✪○ Moderate: The authors believe that the true effect is probably close to the estimated effect
✪✪○○ Low: The true effect might be markedly different from the estimated effect
✪○○○ Very low: The true effect is probably markedly different from the estimated effect
Guideline: Recommendation is from a published guideline that used methodology deemed acceptable by the team
Expert Opinion: Based on available evidence that does not meet GRADE criteria (for example, case-control studies)

Bibliography

Literature Search Methods

Studies were identified by searching electronic databases using search strategies developed and executed by a medical librarian, Susan Groshong. Searches were performed in June, 2018, in the following databases: Ovid Medline, Cochrane Database of Systematic Reviews, Embase, National Guideline Clearinghouse, TRIP and Joanna Briggs Institute. In Medline and Embase, appropriate Medical Subject Headings (MeSH) and Emtree headings were used respectively, along with text words, and the search strategy was adapted for other databases using text words. Concepts searched were empyema and pleural effusion. Retrieval was limited to 2008 to current, English language, humans, and to certain evidence categories, such as relevant publication types, index terms for study types and other similar limits. Additional articles were identified by team members and added to results.



Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535

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Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

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