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# Trust Guideline for the management of Parapneumonic Effusion in children

## A clinical guideline recommended for use

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| **For Use in:** | Buxton ward, Children's Assessment Unit (CAU) |
| **By:** | All staff |
| **For:** | Children with parapneumonic effusion |
| **Division responsible for document:** | Women and Children's Services |
| **Key words:** | Empyema, parapneumonic effusion, fibrinolytics, |
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| **Assessed and approved by the:** | Clinical Guidelines Assessment Panel (CGAP)<br>If approved by committee or Governance Lead Chair's Action; tick here ✓ |
| **Date of approval:** | 23/08/2021 |
| **Ratified by or reported as approved to** (if applicable)**:** | Clinical Safety and Effectiveness Sub-Board |
| **To be reviewed before:**<br>This document remains current after this date but will be under review | 30/11/2021 |
| **To be reviewed by:** | Dr Caroline Kavanagh |
| **Reference and / or Trust Docs ID No:** | 1210 |
| **Version No:** | 5.1 |
| **Compliance links:** *(is there any NICE related to guidance)* | None |
| **If Yes - does the strategy/policy deviate from the recommendations of NICE? If so why?** | N/A |

This guideline has been approved by the Trust's Clinical Guidelines Assessment Panel as an aid to the diagnosis and management of relevant patients and clinical circumstances. Not every patient or situation fits neatly into a standard guideline scenario and the guideline must be interpreted and applied in practice in the light of prevailing clinical circumstances, the diagnostic and treatment options available and the professional judgement, knowledge and expertise of relevant clinicians. It is advised that the rationale for any departure from relevant guidance should be documented in the patient's case notes.

The Trust's guidelines are made publicly available as part of the collective endeavour to continuously improve the quality of healthcare

through sharing medical experience and knowledge. The Trust accepts no responsibility for any misunderstanding or misapplication of this document.

**Trust Guideline for the management of Parapneumonic Effusion in children**
**Version and Document Control:**

| Version Number | Date of Update | Change Description | Author |
|---|---|---|---|
| 5.1 | 23/08/2021 | Reviewed and remains current but short review to allow for thorough review | Ashok Ram, Ashish Minocha, Shalini Singh |
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## Trust Guideline for the management of Parapneumonic Effusion in children

## Quick reference guideline

### Algorithm for the management of pleural Infection in children

## Trust Guideline for the management of Parapneumonic Effusion in children

### Objective

To manage children with parapneumonic effusion effectively, including the use of intrapleural urokinase as a fibrinolytic agent.

### Rationale

Early use of urokinase decreases morbidity in children with parapneumonic effusion and reduces the need for invasive interventions, such as thoracoscopic debridement or open surgery. The British Thoracic Society (BTS) guideline (1) has advocated the use of urokinase for any child with a complicated effusion or empyema (Grade B recommendation). The Royal College of Paediatrics and Child Health (RCPCH) appraisal (2) of this guideline reinforced this view (Grade B recommendation).

### Broad recommendations

See the Algorithm for the management of pleural infection in children (from (2)). This guideline should be used in conjunction with the "Trust guidelines for the management of Childhood Pneumonia Trustdocs Id: 1150

### Clinical audit standards

- Length of hospital stay
- Pre-treatment chest ultrasound for all patients
- Rates of drains falling out
- Appropriate analgesia given

### Summary of development and consultation process undertaken before registration and dissemination

This guideline arose from the realisation that there was mounting evidence that intrapleural urokinase helps in the management of parapneumonic effusion in childhood (3,4,5). Preliminary meetings were held between an interested group of Consultant Paediatric Physicians, Consultant Paediatric Surgeons and Consultant Thoracic Surgeons and some junior medical and nursing staff. Agreement was reached that the evidence for the use of urokinase was much stronger in children than in adults. It was also agreed that chest drains, if necessary, would be inserted via the Paediatric Surgical team or Adult Thoracic Surgeons and under a general anaesthetic in most instances.

The guideline was prepared by the authors and discussed at Paediatric Directorate guideline meetings. It was then disseminated for comment to all Consultant Paediatric Physicians, Paediatric Surgeons and Thoracic Surgeons and to representatives from Paediatric Nursing, Accident & Emergency, Paediatric Anaesthesia, Radiology, Physiotherapy and Microbiology. Comments received were acted upon prior to formal application to Clinical Guidelines Assessment Panel.

A. **Criteria for chest drain insertion:**

All children coming into the categories below should be discussed with the Named Consultant Paediatrician and one of the Paediatric Respiratory Consultants (Dr Upton or Dr Kavanagh) and a Consultant Paediatric Surgeon, who will liaise with the Thoracic Surgeon on-call. Of the Paediatric Surgeons, Mr Minocha, Mr England and Mr Mathur are happy to take the lead for management of parapneumonic effusion and Mr Minocha or Mr England will do so in working hours even if Mr Kulkarni or Mr Tsang is on call. Out of hours and on rare occasions when none of the two ( AM or RE) is available, the on call Paediatric Surgeon will assess the patient and request the adult Thoracic team to take over the care while providing the middle grade support in theatre and ongoing support on Buxton Ward. They will then hand over the surgical care to AM or RE during normal working hours.

1. **Clinical diagnosis of complicated parapneumonic effusion or empyema**. Some children with a large effusion at admission with signs of respiratory distress and an oxygen requirement will need early chest drain insertion. Whether an ultrasound is performed first depends on the availability of a radiologist and the severity of respiratory distress. An ultrasound can always be performed after drain insertion, to look for evidence of loculation.

2. **Diagnosis of pneumonia, with treatment failure (persisting high fever and/or clinical or radiological signs of an effusion) after 48 hours of parenteral antibiotics.** A chest ultrasound is the investigation of choice in this situation. Should this confirm a significant effusion, a chest drain should be inserted. There is no place for diagnostic taps unless malignancy is suspected.

B. **Exclusion criteria for chest drain:**

Established empyema of >7 days duration with evidence of thickened pleura on US scan. Such patients should be discussed with a Consultant Paediatric or Thoracic Surgeon to consider either a video-assisted thoracoscopy or decortication.

C. **Investigations:**

- Essential - FBC, CRP, Blood culture, Sputum culture or cough swab, PA CXR (there is no need for routine lateral X-Rays), Chest USS (radiologist marking the most appropriate place for a drain, though not posteriorly).
- Consider - Clotting screen, ASO titre, U&Es, LFTs

D. **Procedure for drain insertion:**

1. Most chest drains will be inserted under a General Anaesthetic by the Paediatric Surgical team supported by the Adult Thoracic Surgical Team. They will make arrangements with theatre and the appropriate anaesthetist.

2. The chest drain should be appropriate for the age of the child. Small bore percutaneous drains are preferred to large bore surgical drains. Size 8-10 can be used in most children. Young adolescents may require 10-12, but very rarely size 14 and beyond.

Fine bore Seldinger catheters are preferred by some surgeons.

3. Send the pleural fluid for differential cell count, Gram stain and culture and sensitivity. At present this is also usually sent for PCR if parent's consent to the UK pneumococcal surveillance study (when this finishes it may be appropriate to send all for PCR routinely). If this appears classical for infection with >90% polymorphs, then cytology and biochemistry (protein, glucose, LDH) are not necessary. Tuberculosis and malignancy must be excluded in the presence of pleural lymphocytosis.

4. Ensure monitoring after the procedure- HR, RR and SaO2 in a High Observation bed on Buxton Ward. Use humidified oxygen to maintain SaO2 above 92%. Arrange a Chest X-Ray after return from theatre to ascertain drain position and to check for initial fluid drainage.

5. Continue other pneumonia management – analgesia for chest pain and fluid therapy if child unable/unwilling to drink.

6. Continue iv antibiotics, which should be reviewed in the light of sputum/cough swab culture, blood culture and pleural fluid microscopy.

7. Routine chest physiotherapy is not beneficial. However, physiotherapists may help with increasing lung volume or with airway clearance where indicated. Early mobilisation and exercise is recommended.

8. The Newcastle study into Pneumococcal typing in cases of empyema continues. The packs for this are available through Dr Kavanagh and Dr Upton's secretary. Either Dr Kavanagh or Dr Upton will seek consent from parents.

E. **Use of urokinase:**

1. The expectation is that all children having a drain inserted for parapneumonic effusion will be treated with intrapleural urokinase. An exception would be the child with a large effusion requiring early drainage for respiratory distress, when an ultrasound shows no loculation. Even in these children the situation should be reviewed with repeat ultrasound if fluid does not continue to drain and the child has not recovered.

2. Note that the use of urokinase in this situation is off-licence but supported by National Guidelines (4,5).

3. All children with echogenic or loculated pleural fluid on ultrasound should receive urokinase unless they have deranged clotting or thrombocytopaenia, which has not been corrected by appropriate blood products.
4. Urokinase is given 12-hourly for six doses. It will usually be given by the Paediatric Medical SHO on-call or trained senior nursing staff at 06.00 and 18.00, regardless of the time of drain insertion. Sterile precautions should be used. Consider the need for analgesia just before the procedure. **A DVD is available on Buxton Ward to demonstrate the procedure.** This shows the use of metallic clamps but a popular alternative now is to use 3-way taps, though a connector is then needed for larger bore drains.

5. Two bladder syringes are needed, one empty and one prepared with the dose of urokinase. First clamp the drain tubing using a standard metallic chest drain clamp.

6. Disconnect the drain from the reservoir tubing and attach the empty bladder syringe to the drain. Remove the clamp and gently aspirate to remove any fluid or air from the system. Then reapply the standard metallic chest drain clamp to the drain and remove the syringe.

7. Attach the syringe containing urokinase and then remove the standard metallic chest drain clamp from the drain. Instil urokinase 40,000 units diluted in 40 mL of normal saline for children above one year of age, and 10,000 units of urokinase in 10mL of normal saline for children below one year of age.

8. Clamp the chest drain for 4 hours using a disposable plastic umbilical clamp (not a metallic clamp). This is light enough for the child to be ambulant and they should be encouraged to mobilize during this period.

9. After the four hours has elapsed connect the drain back up to the reservoir tubing. Make sure the reservoir level has been marked with an indelible pen, so the precise volume drained can be measured. Remove the umbilical clamp. Connect the chest drain to suction at a pressure 2-3 KPa for a period of 8 hours.

10. Repeat the steps 3-8 for a total of 6 cycles. (Instil urokinase 12 hourly for 3 days). Further cycles are very rarely required and, should only be given following discussions with the Consultant Paediatrician and Paediatric Surgeon /Adult Thoracic Surgeon.

11. Urokinase is generally safe. Occasionally there may be slight blood staining of the pleural fluid.

F. **<u>Later care</u>:**

1. Reduction in the volume of fluid draining and resolution of fever are the best guides to clinical improvement.

2. Repeat the Chest X-Ray on day 4 – it does not routinely need repeating before this. A FBC and CRP may be helpful at this stage if there are doubts about clinical recovery but are not routinely required.

3. If the patient is better with fluid volume reduced and fever settled, the drain should be removed at this stage.

4. A Chest X-ray at four hours post drain removal is NOT required. Note a CXR would not be back to normal and there may still be some fluid still present.

5. If the child has not improved by this stage, consider the need for a repeat ultrasound or CT scan of the chest.

6. If US or CT suggests continued loculated fluid or failure of lung expansion, consider referral for VATS (Video assisted thoracoscopic surgery) or decortication, either via a Paediatric Surgeon or Adult Thoracic Surgeon.

**Discharge criteria:**

1. No respiratory distress in air.
2. Settled temperature <37.5$^0$C over previous 24 hours.
3. Reduced or no residual pleural fluid

Duration of oral antibiotics, usually co-amoxiclav - 1-4 weeks

1.H. **Follow up:**

Children's Respiratory Clinic in 3 months with repeat CXR.

**Distribution list/ dissemination method**

Trust Intranet, Buxton ward, CAU, Theatre 12

**References/ source documents**

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