NW London Haemoglobinopathy Managed Clinical Network
Acute Chest Syndrome in Sickle cell Disease (Adults) -Management Guideline

Updated with reference to BCSH guideline on the management of acute chest syndrome in sickle cell disease (2015).

Acute Chest Syndrome (ACS) is the leading cause of death in adults with SCD with a mortality of 9%. Prompt diagnosis and management, with early involvement of Haematology SpR/Consultant is essential.

1. Definition

ACS is an acute illness characterised by fever (not always present) and respiratory symptoms accompanied by a new pulmonary infiltrate on CXR.

It is often multifactorial in origin with infection, sludging/sickling or thrombosis of pulmonary arteries and fat embolism due to bone marrow necrosis giving a similar clinical picture.

2. Symptoms

Symptoms may develop during an acute painful vaso-occlusive limb, abdominal crisis or other high-risk periods (post-op/postpartum). Careful monitoring with observations and daily chest examination should be carried out to detect and treat ACS early.

- Pain, often pleuritic, in chest wall, upper abdomen and/or thoracic spine
- Dyspnoea
- Cough may be a late symptom

3. Signs

- **Hypoxia/fall in SpO2 on air (Measurement on oxygen therapy may delay diagnosis)- severe hypoxia is a predictor of severity and outcome.**
- Fever, tachypnoea, tachycardia
- Pain/tenderness in chest wall-may be due to bony infarction
- Signs of lung consolidation, usually bilateral and intially basal. Bronchial breathing may be striking
- CXR changes. Clinical signs may precede XR findings-Typically segmental, lobar or multi-lobar consolidation usually in lower lobes +/- collapse +/-effusions. Diffuse irregular shadowing

4. Differential diagnosis

ACS and pneumonia are clinically and radiologically indistinguishable. However, consolidation in the upper and/or middle lobes, without basal changes, is suggestive of infection rather than ACS. Bilateral involvement is most likely due to ACS, but atypical pneumonia or viral respiratory infections should be considered. Infection identified in < 35 % (Chlamydia/Mycoplasma pneumoniae, viral, Staph aureus, Strep.

Pneumoniae, Haemophilus influenzae).

Pleuritic pain may also be due to spinal/rib/sternal infarction, pulmonary embolism or subdiaphragmatic inflammation.

5. Investigations

Arterial blood gases (ABG) on air if SpO2 ≤94% or >3% fall from baseline or if dyspnoeic or tachypnoeic. Check on oxygen therapy rather than air if respiratory distress or SpO2< 85 %.

- Monitor SpO2 on air and inspired oxygen 1-4 hourly*
- CXR - may need repeating if clinically deteriorating
- Blood culture if fever. Throat, sputum and urine cultures
- NPA for viral testing (Influenza A , B , parainfluenza, adenoviruses and RSV if coryzal symptoms)
- Blood tests as per acute pain protocol with respiratory infection serology. Blood group/antibody screen and cross-match 8 units of blood early in case deteriorates and needs urgent red cell exchange transfusion
- Urine Pneumococcal and Legionella antigen
- Consider CTPA if pulmonary embolism suspected i.e. hypoxia with no chest signs and normal CXR. Sudden atypical unilateral pleuritic chest pain

* **Close monitoring of SpO2 is important but does not replace the need for ABG**

6. Management

All patients should be treated aggressively irrespective of their sickle genotype. They may deteriorate rapidly so vigilance is required and treatment started urgently to prevent irreversible respiratory failure and lung damage.

All patients should be managed by a senior haematology team (SpR and Consultant). Discuss with ITU/HDU and transfer ASAP if unwell/deteriorating.

If admitted to a unit with low SCD prevalence patient should be discussed by telephone ASAP with Consultant attending/on call in the specialist centre to determine the need for transfer (see NW London Haemoglobinopathy Network guideline on transfer to ICU/HDU).

- Treat pain as per NW London Haemoglobinopathy Network sickle cell crisis protocol and NICE guidance (to prevent alveolar hypoventilation BUT avoid respiratory depression)
- I/V fluids- as per pain protocol but individualise to avoid fluid overload especially if cardiac/renal compromise. Need strict fluid balance chart
- Give humidified oxygen (2-4l/min) to maintain SpO2>95-98% or within 3% from known steady state baseline
- Antibiotics. Treat as per severe community acquired pneumonia (CAP) and atypical pneumonia as per local protocol, taking into account local antibiotic resistance

Suggested: I/V cefuroxime 1.5g iv tds adjusted according to renal function (if severe Penicillin allergy d/w Microbiology team re alternative - Suggested: levofloxacin 500mg iv bd but caution G6PD deficiency) PLUS Clarithromycin 500mg po bd and stop Pen V /Erythromycin prophylaxis. Continue for minimum 7-10 days

- Antiviral agents if H1N1 suspected – as per local Microbiology advice
- Thromboprophylaxis; as per NICE guidance 2010/local policy
  Suggested: LMWH clexane 40mg s/c daily, 20mg if eGFR <30ml/min and caution if thrombocytopenia or coagulopathy. (May need anti-Xa monitoring if nephropathy)
- Incentive Spirometry (see table below) and consider chest physiotherapy
- Bronchodilators; regular salbutamol nebulizer 2.5mg in 2.5 mls N Saline qds if history of asthma (may also need steroids), acute bronchospasm or evidence of reversible airways disease
- Monitor SpO2 and ABG on air and oxygen, pulse and RR 1-4 hourly, Hb and CRP daily
- Diuretics should be avoided (CXR/signs may mimic pulmonary oedema) unless there is evidence of fluid overload
- Consider Fat Embolism Syndrome if ARDS, hyponatraemia, neurological signs or multi-organ failure. Manual exchange transfusion or combined automated red cell and plasma exchange may be beneficial

7.1 Advanced respiratory support and transfusion

The following is a general guide as to when to use these treatment modalities.

Advanced respiratory support

- Consider early if worsening respiratory failure, multi-lobar involvement, coexistent lung disease or blood not readily available
- If CPAP/non-invasive ventilation (NIV) indicated but not immediately available proceed to exchange transfusion
- CPAP/NIV must be discussed with the haematology SpR/consultant and the ITU registrar
- Invasive endotracheal ventilation should be considered if worsening acute respiratory failure despite maximal CPAP/NIV, altered consciousness/unable to protect own airway or haemodynamically unstable

Transfusion

Simple top-up transfusion

- Consider if Hb<90g/l and PaO2 <9.0 on air or oxygen requirement increasing
- **Maximum** post-transfusion Hb 100-110g/l

Exchange transfusion

- Indicated if severe, deteriorating or when top-up transfusion contraindicated (Hb >90g/l).
- Either isovolaemic manual exchange (refer to local protocol) or automated erythrocytapheresis. If latter not readily accessible do not delay manual exchange.
- Aim HbS <30% (consider <20 % if in extremis or not improving) and maximum

Hb 100-110g/l with end HCT 0.32.

- If manual exchange reassess clinically and check Hb and HbS% after 4 red cell units to determine need for further exchange. A target HbS of 30-40% may be sufficient if clinical improvement.

Suggested management based on ABG on air**

PaO_2	All patients	Incentive spirometry (as per local protocol)
	8.0 - 9.5 kPa	If early and non-progressive consider CPAP +/- simple top up transfusion if Hb <90g/l
	< 8.0 kPa	Discuss exchange transfusion with SpR and consultant and consider CPAP
	< 7.5 kPa	Exchange transfusion and consider CPAP
	< 7.5 kPa on increasing FiO2 (60%) or CPAP	Intubation and IPPV. Exchange transfusion
$PaCO_2$	>6.7kPa or rising and patient tiring	Consider intubation and IPPV. Exchange transfusion.

****A worsening CXR especially multi-lobar involvement, rapid fall in PaO_2, failure to respond to increased % inspired oxygen, or 25% drop in PaO_2 compared to baseline PaO_2 (in patients with a chronically low PaO_2) can also be used as criteria for exchange transfusion.**

8. Follow-up to prevent recurrent ACS and Chronic Sickle Lung Disease (CSLD)

- Advice should be given on the importance of Penicillin prophylaxis and vaccinations against Pneumococcus and Influenza
- If severe life threatening ACS or recurrent episode consider Hydroxycarbamide therapy (suggest referral to specialist centre). See NWL Hydroxycarbamide guideline
- If Hydroxycarbamide not appropriate or effective consider regular transfusion/red cell exchange programme
- At 6 weeks check baseline SpO2 and request lung function tests
- Arrange echo, HRCT and refer to respiratory team if CSLD suspected