Joint Trust Guideline for the Management of Acute Left Ventricular Failure in Adults

Document Control:

For use in	Norfolk and Norwich University Hospitals (NNUH), James Paget University Hospitals (JPUH)		
	A&E, AMU, medical and surgical wards		
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JCG0001v1	16/06/2014		Change of header and reference to joint hospital version.
JCG0001v2	08/02/2017		Authors name amended. Cardiology Registrar extension added. 'Displaced apex beat' removed.
JCG0001v2.1	10/08/2017		Change of supporter.
JCG0001v2.2	24/04/2020	D C.G-Clarke	No clinical changes at this time but due to Covid-19 a short review date given to allow for thorough review in future.
JCG0001v3	June 2023	Consultant Cardiologist	Document transferred to new Trust Procedural Document template

Previous Titles for this Document:

Previous Title/Amalgamated Titles	Date Revised
None	Not applicable

Distribution Control

Printed copies of this document should be considered out of date. The most up to date version is available from the Trust Intranet.

Consultation

Intensive Care Medicine and Acute Medicine Consultant. Lead for Recognise and Respond Team. Lead for Point of Care Ultrasound in Intensive Care Medicine and Acute Medicine
Cardiology Lead for Heart Failure NNUH
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Monitoring and Review of Procedural Document

The document owner is responsible for monitoring and reviewing the effectiveness of this Procedural Document. This review is continuous however as a minimum will be achieved at the point this procedural document requires a review e.g. changes in legislation, findings from incidents or document expiry.

Relationship of this document to other procedural documents

This document is a clinical guideline applicable to Norfolk and Norwich University Hospitals and James Paget University Hospitals; please refer to local Trust's procedural documents for further guidance.

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Joint Trust Guideline for the Management of Acute Left Ventricular Failure in Adults

1. Introduction

1.1. Rationale

These guidelines were based on a literature review of the subject. The associated LVF bundle is to improve guideline adherence and documentation.

1.2. Objective

To improve the management of acute left ventricular failure throughout the Trusts

The objective of the

- Improve guideline adherence
- Improve documentation
- Make emergency care easier

1.3. Scope

This is a guideline for adults within secondary care, it is not meant for pre-hospital care or those under 17 years.

1.4. Glossary

The following terms and abbreviations have been used within this document:

Term	Definition
JPUH	James Paget University Hospitals
NNUH	Norfolk and Norwich University Hospitals
ABG	arterial blood gas
AMU	acute medical unit
CXR	Chest X-ray
ED	Emergency Department
NTproBNP	NTproBrain Naturetic Peptide
GTN	Glyceryl trinitrate
PEEP	Positive end expiratory pressure
PCI	Percutaneous coronary intervention
LVF	Left ventricular failure
COPD	Chronic obstructive pulmonary disease
RRT	Recognise and Respond Team
CPAP	Continuous positive airway pressure
SpO2	Oxygen saturation %

2. Responsibilities

List each key stakeholder using the job title with information as to their role and responsibilities in relation to this procedural document.

- Dr Shailesh Shah Clinical Lead for Recognise and Respond Team. Lead for Point of Care Ultrasound in Intensive Care Medicine and Acute Medicine
- Dr Cairistine Grahame-Clarke Joint Lead for Heart Failure NNUH
- Dr Sunil Nair Joint Lead for Heart Faillure NNUH & JPUH

3. Policy Principles/ Service to be delivered/Processes to be followed

Patients develop Acute Left Ventricular Failure both on presentation to admitting areas ED/AMU, and on the wards. The approach here depends upon the cause of cardiac deterioration. Those in ED/AMU, may be able to go home or be transferred to Medical SDEC.

Those developing Acute Left Ventricular Failure on the wards often have had an acute deterioration related to their admission pathology. In this group of patients, contacting the Recognise and Respond Team Ext 4444 (if NEWS 2 ≥7 or FiO2 req >50% to maintain SpO2 as per scale target range) alongside parent team to support management.

An LVF bundle (appendix 1) should be completed for all patients with a presumptive diagnosis of acute left ventricular failure. The section outlined in red should be peeled off and stuck in the patient's clinical record and the rest of the bundle sticker is collected in "bundle boxes" for the purpose of audit. These boxes are located in the following areas:

3.1 Start with ABCDE

3.1.1. Airway - Ensure clear and maintained i.e.:

- Unable to verbalise (due to secretions/tiring)
- (GCS <8)
- Evidence of stridor

If any of the above is present, contact the Critical Care StR on call (bleep 0012)

3.1.2. Breathing - Assess work of breathing, respiratory rate, SpO2 and ensure CXR has been performed.

- Is the patient actively tiring (PaCO2 >6.5 and acidosis)?
- Is the RR >30 or <8
- Is the PaO2 <8 or needing ≥50% FiO2 to achieve SpO2 ≥94%

If any of the above is present, contact Cardiology StR on Ext 6627 and Critical Care StR on bleep 0012

3.1.3. Circulation - Assess pulse

- If <40 or >140 or irregular, consider arrhythmia
- Assess peripheral perfusion – grey, clammy, cold skin is typical of acute LVF
- Assess central capillary refill.

Blood pressure – Usually high in LVF, if < 100mmHg and LVF still considered primary diagnosis, then contact Cardiology StR on 6627

12 lead ECG to look for arrythmia, ischaemia or STEMI
If the ECG is normal strongly consider an alternative diagnosis.

3.1.4. Disability - Assess conscious level and blood sugar

- If conscious level reduced do ABG to exclude hypercapnia and ensure airway is secure.

3.1.5. Examine

Examination should confirm symptoms and signs of heart failure and exclude other possible causes of shortness of breath.

3.1.5.1 Cardinal symptoms

Cardinal Symptoms are orthopnoea and paroxysmal nocturnal dyspnoea, shortness of breath is almost universal, fatigue and oedema are far less discriminatory.

3.1.5.2 Signs

Increased respiratory rate, bilateral crackles, with or without reduced breath sounds at the lung bases elevated jugular venous pressure, 3rd heart sound or gallop rhythm.

3.2. Investigations

A CXR is more sensitive than clinical examination.

- The features of pulmonary oedema may include bilateral interstitial or alveolar shadowing, upper lobe blood diversion, pleural effusions, cardiomegaly and Kerley B lines (2). A vascular pedicle width of greater than 70mm (see appendix) suggests LVF (3).

Point of Care Ultrasound is more sensitive than a CXR

- In the presence of LVF and Acute Pulmonary Oedema, lung ultrasound will detect bilateral B-lines, which are gravitationally dependent (increased number and frequency at bases) and pleural effusions (usually bilateral).
- Lung USS detected consolidation, and the above would suggest an infective cause for decompensated heart failure.
- If there is only unilateral B-lines or a unilateral pleural effusion then consider an alternative diagnosis.

Often in compensated heart failure the only sign may be a resting tachycardia. Cold and clammy to touch. Central capillary refill time can be shortened or prolonged.

3.3. Initial Treatment

1) Assess and determine escalation ceilings based on co-morbidities, frailty, involving patient's wishes (if capacity is present) and next of kin. Ensure a ReSPECT form is completed accordingly
2) If patient for active therapies, then;
    a. Ensure adequately monitored**:** continuous ECG and SpO_2 monitoring may be required.
    b. Sit patient up in bed, to 45-90 degrees. Give supplemental oxygen to achieve SpO2≥94% (caution in those with COPD. If known or suspected COPD perform ABG early for PaO2 and PaCO2 targets and planned O2 titration).
    c. Treat arrhythmias – particularly bradycardic arrhythmias <40bpm and tachycardias > 150bpm (if either present, discuss with Cardiology StR

Ext 6627) Ensure STEMI has been excluded by 12 lead ECG. If STEMI call cardiology reg ext 6627. If BP >100mmHg systolic then:

a.i. Deliver Furosemide 50-100mg IV STAT

a.ii. If BP >120mmHg, before furosemide, also initiate GTN infusion 0.5-10mg/hr via peripheral cannula

a.iii. Consider need for CPAP/BiPAP based on O2 requirements and PaCO2

If BP <100mmHg, and diagnosis of left ventricular failure remains pertinent, then the patient may require inotropic support. Contact Cardiology StR on 6627

Arrange further investigations: FBC, U+E, LFT, CRP, Troponin I, NTproBNP

An ABG should also be done in those who are hypoxaemic, those who are drowsy and those with COPD.

3.4. Consider other possible diagnoses (bearing in mind both can be present)

- Pericardial Effusion
- Pneumonia
- Infective exacerbation of COPD/ Interstitial Lung Disease
- Pneumothorax
- Pulmonary Embolus

3.5. If LVF confirmed then assess severity of LVF

3.5.1. Mild LVF

- Resp rate > 15 but < 30
- SpO2 > 90% on Air

3.5.2. Moderate LVF

- Systolic BP > 100mmHg
- SpO2 <90% or Resp rate >30

3.5.3. Severe LVF (Cardiogenic shock)

- Systolic BP <100mmHg
- SpO2 <90%
- Resp rate > 30/min

3.6. Tailor treatment to the severity of LVF

3.6.1. Mild LVF – this group may be able to go home.

a. If not on Furosemide then stat 50mg IV and subsequent daily 40mg PO

b. If already on Furosemide then give normal dose twice per day in morning and at lunchtime (4-7).

c. Move to SDEC (open 8am – 6pm) and facilitate OPD cardiology and heart failure clinic referrals.

3.6.2. Moderate LVF

1) **Give Furosemide 50mg-100mg iv.** This dose may need to be increased in patients with renal dysfunction (4-8).
2) **If BP > 120mmHg systolic then start GTN infusion.** 25mg GTN made up to 50mLs normal saline to run at 0.5mg-10mg/hr. Titrate to maintain BP above 100mmHg (1,9-11).
3) **If very breathless or hypoxic consider giving CPAP with a PEEP of 5-10mmHg.** Caution should be exercised in those with type 2 respiratory failure. This group benefit from a short spell of BiPAP. This needs discussion with the respiratory team. If agreed, titrate FiO2 to 88-92% and start BiPAP at EPAP 5, IPAP 8, initially. Regular (arterial/capillary/venous) blood gas monitoring and senior advice is mandatory. CPAP can be used in type 2 respiratory failure caused by LVF. If hypercapnia worsens on CPAP then air driven CPAP with supplemental oxygen via nasal cannulae can be attempted. If there is still hypercapnoea in this instance, then move to BiPAP, if deemed appropriate.
4) **Consider IV morphine/diamorphine 1 - 5mg iv over 5-10mins (preceeded by 10mg of Metoclopramide iv) to reduce anxiety and work of breathing.** Caution in those with chronic lung disease, COPD, renal failure, or the elderly as they have a higher risk of developing type 2 respiratory failure with morphine. Reduce morphine dose and give very slowly (14).
5) **Consider resuscitation status and limits of care** - In view of the high mortality associated with progressive heart failure (NYHA 3-4) and need for long term planning. A conversation regarding ceilings of care in light of acute illness, co-morbidities, frailty, alongside patient wishes a ReSPECT form must be completed.

3.6.3. Severe LVF (Cardiogenic Pulmonary Oedema with SBP <100mmHg)

1) **Call for help – RRT (4444)** the Cardiology StR (ext 6627) +/-The AMU registrar (bleep 0022) +/- Critical Care (bleep 0012). In this instance, if inotropic support needed, then Acute Medical/Parent Team (if ward based patient) and Cardiology Consultant should be contacted urgently. Critical care may also be needed, once decision made that care needs are beyond those afforded by Coronary Care Unit

   Consider resuscitation status and limits of care - In view of the high mortality associated hypotension and a respiratory rate over 30, the patient's co-morbidity and functional status should be assessed to determine whether the patient is a candidate for critical care and / or resuscitation. a ReSPECT form must be completed.
2) **Give furosemide 50mg iv.** This dose may need to be increased in patients with renal dysfunction (4-8)..
3) **Give CPAP with a PEEP of 5-10mmHg** (see practice points in moderate LVF section) (12,13), with frequent blood pressure monitoring, as there is a risk of CPAP induced hypotension.
4) **Ensure arrhythmias are adequately treated.**
6) **Ensure diagnosis is correct- reconsider diagnosis if ECG 'normal'. Consider requesting urgent echo ext 5672 (physiologist) ext 6627**

(cardiology StR) to confirm diagnosis and exclude mimics of cardiogenic shock (15,16).

7) **With discussion with cardiology ensure there is no ischaemia amenable to PCI.**

8) **Optimise physiology with adequate invasive monitoring including arterial BP monitoring and central venous pressure monitoring.**

9) **Consider augmenting blood pressure with inotropes or intra-aortic balloon pumping.** This guideline recommends dobutamine as the inotrope of choice in cardiogenic shock. It recommends that it is only used on the direction of a consultant as a bridge to more definitive treatment. Dobutamine should be given a dose 2.5 – 15 mcg/kg per min with continuous monitoring of pulse oximetry, BP, ECG and if possible CVP (17).

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5. Audit of the process

Compliance with the process will be monitored through the following:

Key elements	Process for Monitoring	By Whom (Individual / group /committee)	Responsible Governance Committee /dept	Frequency of monitoring
Audit of LVF bundle stickers	Snap audit over course of 1 week	Cardiology department	Cardiology	Every 3 years

The audit results are to be discussed at relevant governance meetings (Cariology Governance Meeting) to review the results and recommendations for further action. Then sent to (Clinical Safety and Effectiveness Sub-Board (CSESB)) who will ensure that the actions and recommendations are suitable and sufficient.

6. Appendices

Appendix 1-LVF bundle

The bundle system has an inherent audit system. The bundle section of this guideline should be printed on sticker paper. The section outlined in red peels off and is stuck in the case notes. The rest the bundle sticker is collected in bundle boxes. This allows an audit trail so that the management of LVF can be audited easily. The audit standards are to have completed the LVF, stuck it to the notes and to have performed the tasks outlined in the LVF bundle.

LVF Bundle

LVF Bundle		
	Tick, or give reason	Time + Initials
Assess patient's ABCDE **Give high flow oxygen via reservoir mask (caution in COPD refer to emergency oxygen administration guidelines)** **Perform ECG, bloods, CXR and ABG**		
Treat arrhythmias – particularly if HR >150 or <40		
Call Cardiology StR (6627) if BP <100 or STEMI on ECG		
Does CXR/POCUS confirm diagnosis of LVF?		
Give Furosemide 50mg-100mg iv if Mod or High risk, or 40 mg po if low risk		
Give GTN infusion if BP >120mmHg		
If hypoxaemic on high flow oxygen, acidotic, hypercapnic or respiratory rate > 30/min consider CPAP		

7. Equality Impact Assessment (EIA)

Type of function or policy	Existing

Division	Medicine	**Department**	Cardiology
Name of person completing form	C Grahame-Clarke	**Date**	8.6.23

Equality Area	Potential Negative Impact	Impact Positive Impact	Which groups are affected	Full Impact Assessment Required YES/NO
Race	none	none	NA	NO
Pregnancy & Maternity	none	none	NA	NO
Disability	none	none	NA	NO
Religion and beliefs	none	none	NA	NO
Sex	none	none	NA	NO
Gender reassignment	none	none	NA	NO
Sexual Orientation	none	none	NA	NO
Age	none	none	NA	NO
Marriage & Civil Partnership	none	none	NA	NO
EDS2 – How does this change impact the Equality and Diversity		It has no impact on this		

Strategic plan (contact HR or see EDS2 plan)?	

- **A full assessment will only be required if: The impact is potentially discriminatory under the general equality duty**
- **Any groups of patients/staff/visitors or communities could be potentially disadvantaged by the policy or function/service**
- **The policy or function/service is assessed to be of high significance**

IF IN DOUBT A FULL IMPACT ASSESSMENT FORM IS REQUIRED

The review of the existing policy re-affirms the rights of all groups and clarifies the individual, managerial and organisational responsibilities in line with statutory and best practice guidance.