Introduction/Background

Pulmonary oedema is a life-threatening condition that can be particularly difficult to manage in patients who have co-existing kidney failure. Failure to identify and manage such patients appropriately and in a timely fashion can and will increase the risk to the patient, including the risk of death.

Management of patients with cardiogenic pulmonary oedema without renal/kidney failure does not fall under the guidance of this document.

ONLY IF A PATIENT HAS RENAL FAILURE (AS DEMONSTRATED BY SERUM UREA AND CREATININE LEVELS) AND HAS SEVERE FLUID OVERLOAD OR PULMONARY OEDEMA SHOULD THIS GUIDELINE BE FOLLOWED
**Guidelines for the Management of Pulmonary Oedema in Patients with Kidney Failure**

- **Patient has Renal Failure and evidence of significant fluid overload and/or pulmonary oedema**
  - Stop all iv fluids, restrict oral fluid intake, nurse in upright position, administer 100% oxygen, use oxygen saturation monitor, monitor hourly urine output

- **Patient is anuric and/or in respiratory distress and/or is a known dialysis patient?**
  - **YES**
    - **Contact the on-call Nephrology Consultant for advice, and consider discussing with Intensive Care.**
    - [100%O2, CPAP (if available), IV nitrate infusion, IV diamorph or morphine and loop diuretics (due to venodilatory effects) can buy some time, but the definitive treatment is usually dialysis]
  - **NO**

- **Patient previously on loop diuretics?**
  - **YES**
    - Give iv furosemide 100mg. Double dose every 60 minutes to a maximum of 400mg as per clinical response and as allowed by cardiovascular status
  - **NO**
    - Give iv furosemide 40mg. Double dose every 60 minutes to a maximum of 320mg as per clinical response and as allowed by cardiovascular status

- **Patient responds to treatment: (reduced shortness of breath, and diuresis >30ml/hr)?**
  - **YES**
    - Discuss case with Medical SpR and/or Nephrologist on-call to establish most appropriate ward for ongoing care
  - **NO**
    - **1.** Give iv nitrates (isoket 0.05% starting at 1ml/hr) if cardiovascular status allows (avoid if systolic BP<100mmHg, and/or HR>120/min)
    - **2.** If BP>100mmHg, then give iv diamorphine or morphine

- **Patient responds to treatment: (reduced shortness of breath, and diuresis >30ml/hr)?**
  - **YES**
    - 1. Review hourly to consider further iv diuretics.
    - 2. Discuss case with Medical SpR and/or Nephrologist on-call to establish most appropriate ward for ongoing care
  - **NO**
    - **Contact on-call Nephrology Consultant and/or Intensive Care for further advice**

**Beware of ototoxicity with rapid infusions of large doses of loop diuretics: give at a maximum rate recommended in BNF (4mg/min for furosemide)**
Duties and responsibilities

The attending doctor must either implement the management plan themselves and review the patient regularly (at least every 15 minutes for the first hour), or ensure that the appropriate handover has taken place to provide safe continuity of care for the patient.

The attending doctor must ensure that the nursing staff are aware of the management plan, and any trigger factors that they must make someone aware of (e.g. what level of blood pressure should be a cause of concern for any specific patient).

The attending doctor should seek advice from the Medical SpR on-call, who in turn should consider discussing the case with the on-call Consultant Nephrologist. The attending doctor may contact the on-call Consultant Nephrologist directly if they are unable to contact the SpR. All anuric patients with renal failure must be discussed with the Consultant Nephrologist on-call.

The Nursing staff must ensure that they are aware of the management plan for the patient, frequency of relevant observations, and escalation plan for management.

Monitoring effectiveness

Episodes of pulmonary oedema/severe fluid overload are inevitable in some patients with Acute Kidney Injury. This guideline will not prevent such episodes, but should facilitate timely management of such episodes.

Annual audits of the management of AKI will be undertaken as part of the response to the NCEPOD report on AKI. We will include in these audits the details of the acute management of the fluid balance in patients with Renal Failure.

References

