Dialysis reaction guideline

University Hospitals of Leicester NHS
NHS Trust

Trust Reference C39/2024

1. Introduction and Who Guideline applies to

Dialysis patients are subjected to a wide range of potential allergens during their treatment and by nature of their number of treatments and interventions, co-morbiities an polypharmacy have more opportunities to become sensitised. As a result reactions during dialysis are not uncommon but are often mistaken for infection, hypovolaemia or cardiovascular intolerance of dialysis.

This guideline is aimed at all healthcare professionsal caring for patients during dialysis to assist them in identifying a reaction to a component of the dialysis treatment and react accordingly.

2. Guideline Standards and Procedures

This guidance aims to raise awareness of the issue whilst acknowledging there is still much to learn. It is important not to assume all reactions are likely to have the same cause as there are multiple possibile causes during dialysis treatment. It is also important to recognise that a patient may react to more than one component and with different reactions to each.

Reactions usually occur within the first half hour of dialysis but can occur some hours later.

An anaphylaxis reaction must be treated as an emergency and dialysis immediatiately dtopped without returning the blood and anaphylaxis protocols followed. Fluid resuscitation must take place separately to the dialysis circuit. Symptoms may include pruritus, urticaria, laryngeal oedema, bronchospasm, dyspnea, chest pain, vomiting, hypoxia, hypotension, and cardiac arrest. The World allergy service grades for reaction and UK Resuscitation council algorithm for anaphylaxis are in Appendix 1 & 2.

The World Allergy Organisation Anaphylaxis Committee defines anaphylaxis as: "A serious systemic hypersensitivity reaction that is usually rapid in onset and may cause death. Severe anaphylaxis is characterized by potentially life-threatening compromise in airway, breathing and/or the circulation, and may occur without typical skin features or circulatory shock being present."
It is characterised by:
• Sudden onset and rapid progression of symptoms.
• Airway and/or Breathing and/or Circulation problems.
• Usually, skin and/or mucosal changes (flushing, urticaria, angioedema). But these are absent in up to 20% of cases and some patients only exhibit hypotension

It is important to note that the UK Resusitation Council guidelines state Approximately half of anaphylaxis episodes reported in the literature are not treated with IM adrenaline, even when reactions occur in a healthcare setting due to lack of recognition of the symptoms. This can be even more challenging during dialysis when hypovolaemic shock doe to anaphylaxis can be misinterpreted as intolerance of fluid removal which is unlikely in the first 30 minutes.

However most reactions are less severe and may not be immediately apparent and only suspected after a trend is identified. Patients reactions to components of the dialysis treatment

may be localised or systemic and may result in: rash, hypotension, nausea, vomiting, pruritis or low saturations, this typically occurs in the first 30 minutes of treatment although it may be later.

If a dialysis reaction is suspected then a process of elimination should be followed with careful recording of responses to each change of consumable and a process to ensure a return to original consumable if no change is seen following the change before eliminating the another possible cause.

2.1 Possible causes

2.1.1 Localised reactions

(Be aware that this may become systemic if exposure continues)

Chlorhexidine – hypersensitivity reaction to chlorhexidine is common particularly if the patient is exposed over long periods, e.g. if chlorhexidine dressing is used. It is also important to allow the product to dry thoroughly before applying a dressing as applying a dressing before the product dries is more likely to lead to a reaction. Reaction may include: burning sensation, redness, swelling, itching, inflammation or breakdown of the exit site. Although the result is typically localised chlorhexidine exposure can result in anaphylaxis and is recorded as one of the most common causes in UHL guideline for the management of suspected anaphylaxis during anaesthesia. An alternative cleaning agent should be used (alcoholic betadine) and the reaction recorded as the product is used during surgery and may result in complications during surgery if not avoided.

Dressing – reaction to the dressing used for the exit site is not uncommon and usually presents as a reddened area around the exit site. Change to alternative hypoallergenic dressing.

EMLA/Denela (Lidocaine cream) – redness or plaeness of skin , buring or itching in the exposed area. Avoid using product, some patients can tolerate Ametop (tetracaine) instead.

Needles – redness and itching around needle site once needles are inserted. May indicate allergy to needles although check sterilisation technique as EO sterilisation has been used on some products, if sterilisation technique is electron beam or steam then it may be a metal allergy. Try dialysis cannula.

Graft material – on rare occasions skin reaction over a AVG can result due to reaction to the graft itself, this can be reaction to the graft material e.g PTFE or sterilisation process of the graft. This has only rarely been recorded but should it be suspected and the reaction is severe then removal of the graft is the only solution.

Unless the reaction is severe do not change more than one product at a time, try change for 2 weeks to allow for healing time. Record symptoms or improvement each dialysis during the two week trial of product change. If reaction continues without improvement, then return to original after 2 weeks. Try to wait one week before attempting an alternative change if possible.

If the reaction is severe around exit site stop all likely causes (e.g. chlorhexidine and dressing) and record reaction/improvement for two weeks. Rechallenge of any product should only take place with medical advice and initially use an unaffected area of skin aware from exit site.

2.1.2 Systemic reactions

These reactions usually occur in the first 30 minutes of dialysis and are often misinterpreted as intolerance of dialysis, cardiac or hypovolaemia. They can include hypotension, shortness of breath, feeling of panic or impending doom, itching, nausea, vomiting, cramp, abdominal pain, or loose stools. They may not occur every dialysis and although this may be present from first exposure it can also occur after some time on dialysis.

If a reaction is considered then a mast cell tryptase test post dialysis should be taken. Eosinophil levels pre and post dialysis should be measured. In order to rule out other causes also take an ECG and blood volume monitoring but do not allow this to delay changing the consumable.

Sterilisation- reaction during dialysis to ethylene oxide was one of the main causes of reaction during 1980's and 1990's. It is now expected that dialysis consumables will have alternative sterilisations e.g. electron beam or steam but occasionally a new product e.g. dialysis needles has been found to be EO sterilised. More generic consumables are often EO sterilised e.g. syringes, giving set. If this is suspected as a cause of reaction patients can be tested for IgE antibodies. If positive for this then alternatives should be sought and the presence of IgE antibodies clearly documented as many medical products are EO sterilised e.g. stents and precautions have to be taken during suergery to avoid EOsterilised consumables. If an alternative sterilisation method cannot be found for a required product then seek advice from allergy specialists. It may be necessary to use products nearing their expiry date to reduce EO exposure.

Dialyser reactions – these are one of the commonest causes of patients experiencing symptoms shortly after commencement of dialysis. Since 1990's most dialysers are steam or electron beam sterilisation and so the most probable cause is the synthetic membrane. This will usually be the first consumable to change. Ensure the change is to a dialyser with cellulose membrane (Nipro Solacea or Sureflux) and not an alternative synthetic membrane (Fresenius polysuphone or Nipro polynephron). Dialyser reactions may show elevated post dialysis tryptase levels but are less likely to result in elevated eosinophil levels pre dialysis).

Permcaths – Some patients seem to react to the central venous catheters (both temporary an permemnant) the cause of the reaction is unknown but all catheters used in UHL are polysuphone catheters sterilsed with ethylene oxide. In the event of severe reaction an alternative could be consider e.g. silicone catheter or alternative sterilsation method. Ideally the solution should be a change to an AVF or AVG. The reaction may start as soon as the catheter is flushed or shortly after commencement of dialysis and may be accompanied with eosinophilia. An association between severe eosinophilia, symptomatic reaction at start of dialysis and permcath use has been identified in a review of UHL patients. Treat with hydrocortisone and chlorphenamine pre dialysis and change to alternative access as soon as possible. Record suspected cause of reaction for reference should CVC be required in future. Consider allergy testing to determine component causing the reaction to assist in identifying alternative CVC should it be necessary.
Some CVCs are coated e.g. with silver, antibitiotic or antithromobolytic e.g. heparin, Endexo. If a catheter reaction is considered then it the potential reaction to coating should not be overlooked. Within UHL the only coated catheter is Bioflow Duramax which is Endexo coated.

Medication – patients may react shortly after administration of medication e.g. IV iron, ESA. Patients may react top medications given on dialysis – e.g. ESA or iron and this should be considered should a reaction occur post administration. In particular anaphylactoid reactions have been identified post administration of iron isomaltoside. Following a serious reaction the product should immediately be discontinued. For minor reactions some patients can tolerate another route e.g. sc rather than IV for ESA. Altering the timing of the administration can help e.g for patients with minor GI reaction delaying until end of dialysis can be helpful although it is always preferable to try another product.
Heparin – patients may adversely react to heparin which is given during dialysis, this results in antibodies that activate platelets in the presence of heparin resulting in thromboembolic complications. It is believed to affect 0.26% of haemodialysis patients. It can be identified by a drop in platelet count and treated by avoidance of heparin. Fondaparinux is commonly used as an anticoagulant during dialysis and taurolock instead of Taurolock Hep or Citralock used as the

alternative catheter lock, see UHL guideline; Heparin-induced thrombocytopenia in haemodialysis patients.
Medication may also predispose a patient to having a reaction e.g. ACE inhibitor

Other possible causes
Catheter lock– There is a possibility of reaction to the citrate in catheter lock, this is more likely to result in a reaction at end of dialysis as it is estimated 20% of the product enters the blood stream at this point. Should this be suspected, an alternative can be sought (both Taurolock and citra lock include citrate). Heparin sodium may be used as the alternative whilst this is being investigated but should it be the cause of the reaction a product with an antimicrobial agent should be sought.
Water quality – impaired water quality can result in pyrexia or haemolysis resulting in a anaemia. Regular checking of water quality should prevent this.

Although reactions on dialysis are usually seen within 30 minutes of exposure they can occur up to 4 hours later and should be considered if recurrent symptoms are seen later in dialysis or post dialysis. However should this occur it is important that hypovolaemia due to fluid removal is ruled out (review with blood volume monitoring and body composition monitoring if available) and also take post dialysis bicarbonate to rule out alkolosis post dialysis which can result in patients feeling unwell at this stage.

3. Education and Training

Are there any new skills required to implement the guideline? Is a training programme being provided to support implementation or is it more a case of 'awareness raising'

If there are no education or training requirements please state 'None'.

4. Monitoring Compliance

What will be measured to monitor compliance	How will compliance be monitored	Monitoring Lead	Frequency	Reporting arrangements
Recording of all dialysis reactions on nursing dashboard				

5. Supporting References (maximum of 3)

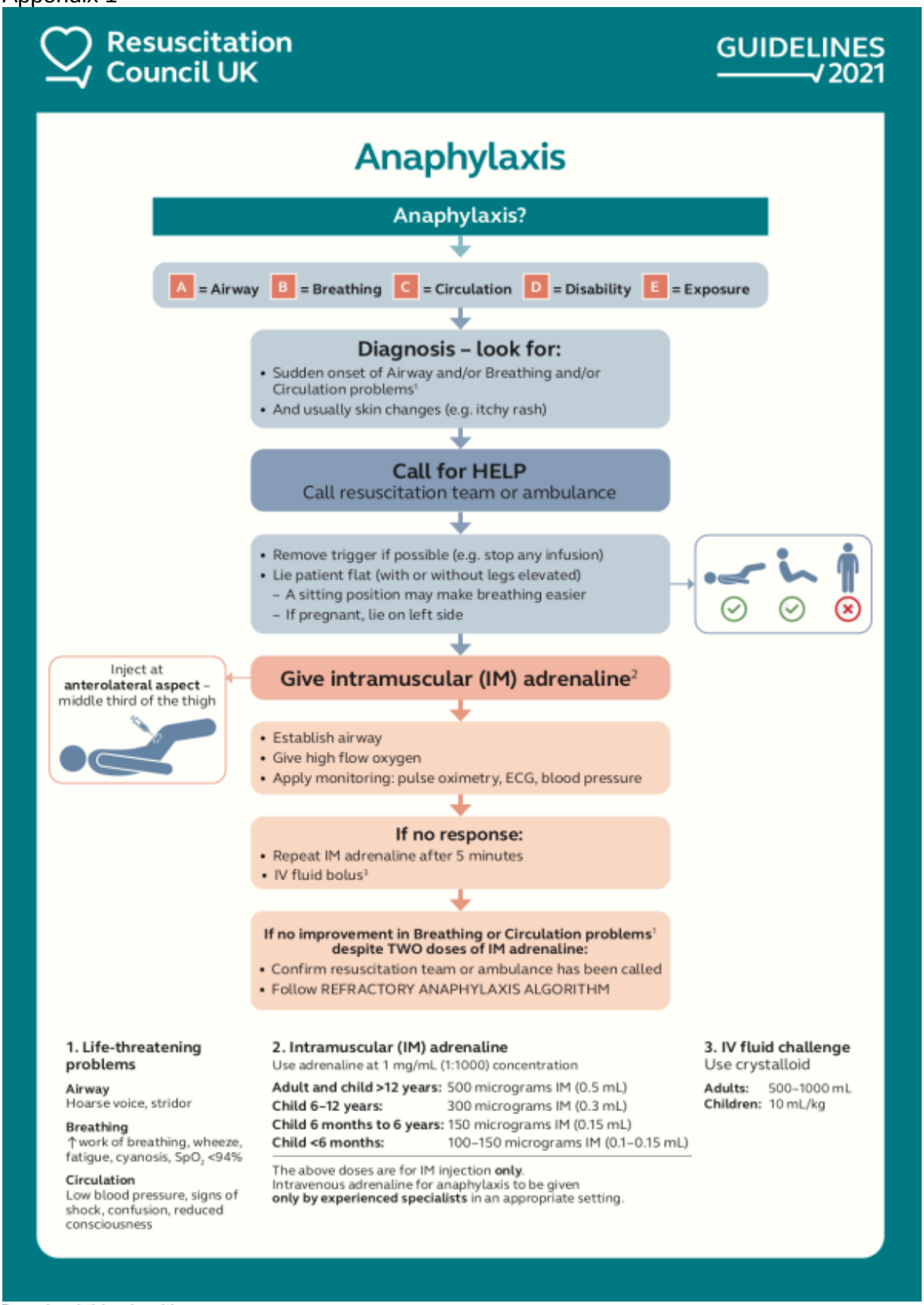
If None say NONE

6. Key Words

List of words, phrases that may be used by staff searching for the Guidelines on PAGL If none – state none.

CONTACT AND REVIEW DETAILS	
Guideline Lead (Name and Title)	**Executive Lead**

Appendix 1



Download this algorithm:
https://www.resus.org.uk/sites/default/files/2021-04/Anaphylaxis%20algorithm%202021.pdf

Appendix 2

TABLE I. World Allergy Organization Subcutaneous Immunotherapy Systemic Reaction Grading System (see text)

Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
Symptom(s)/sign(s) of 1 organ system present* **Cutaneous** Generalized pruritus, urticaria, flushing, or sensation of heat or warmth† **or** Angioedema (not laryngeal, tongue or uvular) **or** **Upper respiratory** Rhinitis - (eg, sneezing, rhinorrhea, nasal pruritus and/or nasal congestion) **or** Throat-clearing (itchy throat) **or** Cough perceived to originate in the upper airway, not the lung, larynx, or trachea **or** **Conjunctival** Erythema, pruritus or tearing **Other** Nausea, metallic taste, or headache	***Symptom(s)/sign(s) of more than 1 organ system present*** **or** **Lower respiratory** Asthma: cough, wheezing, shortness of breath (eg, less than 40% PEF or FEV_1 drop, responding to an inhaled bronchodilator) **or** **Gastrointestinal** Abdominal cramps, vomiting, or diarrhea **or** **Other** Uterine cramps	**Lower respiratory** Asthma (eg, 40% PEF or FEV_1 drop NOT responding to an inhaled bronchodilator) **or** **Upper respiratory** Laryngeal, uvula, or tongue edema with or without stridor	**Lower or upper respiratory** Respiratory failure with or without loss of consciousness **or** **Cardiovascular** Hypotension with or without loss of consciousness	Death

Patients may also have a feeling of impending doom, especially in grades 2, 3, or 4.

Note: Children with anaphylaxis seldom convey a sense of impending doom and their behavior changes may be a sign of anaphylaxis; eg, becoming very quiet or irritable and cranky.

Scoring includes a suffix that denotes if and when epinephrine is or is not administered in relationship to onset of symptom(s)/sign(s) of the SR:a, ≤ 5 minutes; b, >5 minutes-to ≤10 minutes; c: >10 to ≤20 minutes; d:>20 minutes; z, epinephrine not administered.

The final grade of the reaction will not be determined until the event is over, regardless of the medication administered. The final report should include the first symptom(s)/sign(s) and the time of onset after the subcutaneous allergen immunotherapy injection*** and a suffix reflecting if and when epinephrine was or was not administered, **eg, Grade 2a; rhinitis:10 minutes**.