

[HOSPITAL / HEALTH AUTHORITY NAME]

RENAL FAILURE AND DIALYSIS-RELATED EMERGENCIES PATHWAY

Protocol 47: Missed Dialysis, Hyperkalaemia, Fluid Overload, Uraemic Complications, Dialysis Access Emergencies, Peritoneal-Dialysis Peritonitis, and Urgent Dialysis Transfer

DRAFT FOR EMERGENCY MEDICINE, INTERNAL MEDICINE, NEPHROLOGY, PAEDIATRICS, CRITICAL CARE, CARDIOLOGY, INFECTIOUS DISEASES / MICROBIOLOGY, VASCULAR SURGERY, INTERVENTIONAL RADIOLOGY, UROLOGY, OBSTETRICS, PHARMACY, NURSING, DIALYSIS SERVICES, LABORATORY SERVICES, TRANSFUSION MEDICINE, PALLIATIVE CARE, AMBULANCE / TRANSFER SERVICES, AND CLINICAL GOVERNANCE

STATUS: This is a draft clinical-governance document. It must be adapted to local haemodialysis and peritoneal-dialysis services, dialysis schedules and prescriptions, renal formulary, antimicrobial resistance, vascular-access expertise, laboratory turnaround, blood-bank capability, critical-care capacity, nephrology availability, ambulance and inter-island transfer arrangements, paediatric and pregnancy pathways, and applicable legislation before implementation.

RENAL SAFETY RULE: A dialysis patient with dyspnoea, chest pain, weakness, collapse, fever, confusion, severe hypertension, active access bleeding, absent access thrill, cloudy peritoneal effluent, or a missed treatment may have a time-critical emergency. Begin ABCDE stabilization and complication-specific treatment immediately. Do not wait for nephrology review or transport before treating hyperkalaemia, pulmonary oedema, shock, sepsis, hypoglycaemia, or major haemorrhage.

Document control	Details
Document owner	Emergency Department / Medical Services Directorate / Nephrology / Dialysis Services / Nursing Services / Clinical Governance
Clinical leads	Emergency Medicine; Internal Medicine; Nephrology; Paediatrics; Critical Care; Cardiology; Infectious Diseases / Microbiology; Vascular Surgery / Interventional Radiology; Urology; Obstetrics; Pharmacy; Nursing; Dialysis Services; Laboratory; Transfusion Medicine; Palliative Care; Ambulance / Transfer Services
Applies to	Children, adolescents, pregnant people and adults with kidney failure receiving haemodialysis, peritoneal dialysis, home dialysis or intermittent dialysis during acute illness; patients with advanced CKD or AKI who may require urgent kidney replacement therapy; and patients presenting with dialysis-access or treatment-related complications.
Interfaces	Protocol 1 Patient Journey; Protocol 2 Triage; Protocol 3 Resuscitation / Sepsis / Shock; Protocol 4 Assessment and Documentation; Protocol 6 Pain Management; Protocol 8 Medication Safety; Protocol 14 Fever / Sepsis; Protocol 15 Respiratory Distress; Protocol 16 Chest Pain; Protocol 17 Altered Mental Status; Protocol 19 Seizures; Protocol 22 Arrhythmias; Protocol 23 Severe Hypertension; Protocol 24 Abdominal Pain; Protocol 25 GI Bleeding; Protocol 26 Dehydration / Electrolytes; Protocol 27 Glycaemic Emergencies; Protocol 28 AKI / Dangerous Electrolytes; Protocol 29 Poisoning; Protocol 31 Major Trauma; Protocol 34 Limb Injury / Neurovascular Compromise; Protocol 38 Obstetric Emergencies; Protocol 40 Paediatric Assessment; Protocol 41 Neonatal Emergencies; Protocol 44 Frailty; Protocol 46 Immunocompromised / Oncology; Protocol 48 Airway / Ventilation; Protocol 49 Major Haemorrhage / Transfusion; Protocol 52 Palliative Emergencies; Protocol 53 Observation Care; Protocol 54 Infection Prevention; Protocol 57 Utility / Equipment Downtime.
Version / status	Draft 1.0 for local multidisciplinary validation
Review cycle	After any death, major haemorrhage, severe hyperkalaemia event, dialysis transfer delay, access loss, PD peritonitis incident, medication error or serious deterioration; otherwise at least every 2 years.
Approval date / next review	_____ / _____

1. Purpose

To provide a standardized emergency-department pathway for rapid recognition, stabilization, investigation, treatment, reassessment and safe disposition of patients with renal failure, urgent dialysis indications, missed or interrupted dialysis, vascular-access complications, peritoneal-dialysis complications, and other dialysis-related emergencies.

2. Scope

- Applies from triage through resuscitation, observation, admission, dialysis, specialist referral, inter-facility transfer or discharge.
- Includes haemodialysis, haemodiafiltration, peritoneal dialysis, home therapies and emergency kidney replacement therapy. It does not replace dialysis-unit operating procedures or specialist prescriptions.
- Addresses physiology rather than the creatinine or urea value alone. The need for urgent dialysis is based on refractory or life-threatening complications, trajectory, comorbidity and goals of care.
- Protocol 28 remains the primary pathway for general AKI, oliguria and dangerous electrolyte disorders; this protocol adds dialysis-specific assessment, access protection and transfer standards.

3. Core policy statements

1. All dialysis patients receive full triage observations, bedside glucose, medication review, last-dialysis history, access assessment and early ECG when hyperkalaemia, chest symptoms, weakness, collapse or missed dialysis is possible.
2. Life-threatening hyperkalaemia is treated immediately with membrane stabilization and intracellular potassium shift according to the approved emergency algorithm while definitive potassium removal and dialysis are arranged.
3. Pulmonary oedema in an anuric or oliguric dialysis patient requires early non-invasive ventilation when appropriate, nitrate therapy when hypertensive, and urgent ultrafiltration / dialysis planning. Repeated empiric fluid boluses may be fatal.
4. An arteriovenous fistula or graft is not used for blood pressure measurement, venepuncture, routine IV access, medication administration or blood sampling. It is cannulated only by trained, authorized staff when clinically necessary.
5. Active fistula, graft or catheter haemorrhage is a major-haemorrhage emergency. Apply uninterrupted focal pressure, resuscitate, reverse correctable coagulopathy when indicated, and obtain urgent vascular / renal help.
6. Cloudy peritoneal-dialysis effluent is presumed to represent peritonitis until confirmed or excluded. Send effluent promptly and give empiric antibiotics without avoidable delay under the local PD pathway.
7. A missed dialysis session is not a diagnosis or automatic reason for discharge. Assess potassium, acid-base status, volume, uraemic symptoms, infection, access function, medications, residual urine and the barrier that caused missed care.

8. Dialysis catheters are handled only by trained staff using strict asepsis. Do not remove, flush, declot, exchange or access them casually in the ED.
9. Drug choice, dose and timing must account for kidney function, dialysis modality and dialysability. Time-critical treatment is not withheld; the dose is adjusted with pharmacist / renal support.
10. When dialysis or vascular-intervention capability is unavailable locally, stabilization and transfer activation occur in parallel. Transfer delay never justifies delaying temporizing treatment or reassessment.

4. Definitions and clinical framework

Term	Operational meaning
Kidney replacement therapy (KRT)	Haemodialysis, haemodiafiltration, peritoneal dialysis or continuous KRT used to control volume, electrolytes, acid-base balance and uraemic solutes.
Urgent dialysis indication	A life-threatening or refractory complication likely to improve with KRT, such as severe hyperkalaemia, pulmonary oedema / fluid overload, severe metabolic acidosis, uraemic pericarditis or encephalopathy, selected poisonings, or persistent complications of kidney failure.
Dry / target weight	The individualized post-dialysis weight at which excess extracellular fluid is minimized without symptomatic hypovolaemia; it may change with illness, nutrition and pregnancy.
AV fistula / graft	Surgically created vascular access. Presence of a bruit / thrill suggests flow but does not exclude stenosis, infection, aneurysm or distal ischaemia.
Dialysis catheter	Tunnelled or non-tunnelled central venous catheter dedicated to dialysis. It has high infection, thrombosis and bleeding risk.
PD peritonitis	Inflammation / infection associated with peritoneal dialysis, usually presenting with cloudy effluent and / or abdominal pain; diagnosis uses symptoms, effluent cell count / differential and culture.
Residual kidney function	Remaining urine and solute / fluid clearance in a patient receiving dialysis. It affects fluid tolerance, medicine handling and urgency but may deteriorate acutely.
Dialysis disequilibrium syndrome	Neurological symptoms caused by rapid osmotic shifts, most often during or after initial or very intensive dialysis; it is a diagnosis of exclusion.

5. Roles and accountability

Role	Minimum responsibility
Triage nurse	Identify dialysis modality, schedule, last completed treatment, missed sessions, access type and danger signs; protect access limb; obtain full observations, glucose and early ECG pathway; escalate immediately.
Primary ED nurse	Continuous monitoring when unstable; establish non-access IV / IO access; obtain bloods and cultures safely; administer time-critical treatment; document fluid balance and reassessment; preserve PD effluent and access devices.
ED clinician	Lead ABCDE; identify hyperkalaemia, overload, sepsis, haemorrhage, access failure and urgent KRT indications; prescribe renal-adjusted treatment; contact nephrology / dialysis service; define transfer and disposition.
Senior ED / medical / paediatric clinician	Review all unstable, recurrently symptomatic, diagnostically uncertain, access-threatening or potentially dischargeable cases; coordinate critical care, transfer and goals-of-care decisions.
Nephrology / dialysis service	Provide baseline and prescription information, access advice, KRT timing / modality, PD antibiotic plan, dialysis catheter decisions and receiving-team coordination.
Vascular surgery / interventional radiology	Urgent management of uncontrolled bleeding, aneurysm / pseudoaneurysm, thrombosis, limb ischaemia, venous hypertension, catheter dysfunction and threatened access.
Pharmacy / microbiology	Renal and dialysis dosing, dialysability, interaction review, antimicrobial selection, therapeutic monitoring and PD / line infection support.
Clinical governance	Maintain emergency dialysis contacts, transfer agreements, hyperkalaemia medicines, access-bleeding kit, staff training, audit and serious-incident learning.

6. Required readiness

Resource	Required local standard
Identification	Dialysis alert, modality, schedule, target weight, access diagram, last prescription, treating centre, emergency contact and goals-of-care plan.
Hyperkalaemia response	12-lead ECG, continuous monitoring, IV calcium, insulin / glucose, beta-agonist, glucose monitoring, repeat potassium testing, potassium-removal strategy and urgent dialysis transfer pathway.
Respiratory support	Oxygen, CPAP / BiPAP where appropriate, nitrate infusion or titration pathway, airway equipment and critical-care support.
Access haemorrhage	Sterile gauze, haemostatic dressings, direct-pressure instructions, major-haemorrhage activation, blood products, anticoagulant reversal, vascular surgical contact and transfer capability.
PD capability	Sterile effluent collection containers, cell count / differential / Gram stain / culture process, local empiric antibiotic pathway, trained PD staff or immediate renal support, and transfer arrangement.
Laboratory	Urgent potassium with rapid repeat, bicarbonate / blood gas, urea / creatinine, calcium / magnesium / phosphate, glucose, FBC, coagulation, cultures, group and screen, and haemolysis index / CK / LDH when indicated.
Medication safety	Renal formulary, dialysis dosing reference, nephrotoxin / potassium / magnesium / phosphate warnings, hypoglycaemia prevention after insulin-glucose and pharmacist access.

Resource	Required local standard
Referral	24/7 nephrology / dialysis, vascular surgery / interventional radiology, critical care, paediatric nephrology, obstetrics and regional transfer contacts; plan for dialysis service or utility downtime.

7. Triage and immediate danger recognition

Finding	Immediate response
Severe dyspnoea, frothy sputum, hypoxia, inability to lie flat, marked hypertension or diffuse crackles	Resuscitation area; upright position; oxygen / NIV; ECG; nitrate if hypertensive and appropriate; avoid routine fluid; urgent dialysis / ultrafiltration and critical-care contact.
Weakness, paralysis, palpitations, bradycardia, broad QRS, sine-wave pattern, ventricular arrhythmia, collapse or missed dialysis	Treat suspected severe hyperkalaemia immediately; continuous monitoring; repeat non-haemolysed potassium; arrange urgent dialysis.
Active spurting or uncontrolled bleeding from fistula, graft, aneurysm or catheter	Major haemorrhage response; firm uninterrupted focal pressure; IV / IO away from access; blood products / reversal; urgent vascular and renal transfer.
Absent thrill / bruit, new access pain, swelling, cool hand, numbness, weakness, prolonged bleeding after dialysis or enlarging aneurysm	Protect access; urgent renal / vascular assessment; ultrasound or intervention pathway. Do not cannulate, compress circumferentially or delay.
Fever, rigors, hypotension, confusion, line tenderness / discharge or recent dialysis	Sepsis pathway; peripheral and line cultures when safe and trained; immediate renal-adjusted IV antibiotics; consider catheter-related bloodstream infection.
Cloudy PD effluent, abdominal pain, fever, vomiting or diarrhoea	Presume PD peritonitis; send effluent urgently; empiric Gram-positive and Gram-negative coverage via approved pathway; assess sepsis and surgical abdomen.
Chest pain, syncope, severe headache, seizure, confusion or focal deficit	Standard cardiac / neurological resuscitation plus renal-specific electrolyte, BP, anticoagulant and dialysis review. Do not dismiss symptoms as "uraemia."
Missed dialysis with no overt symptoms	Urgent monitored assessment rather than waiting-room return: ECG, potassium, bicarbonate, volume status, access function and same-day dialysis plan.

ACCESS LIMB PROTECTION: Place a visible "NO BP / NO NEEDLES / NO IV" alert on the fistula or graft limb. A palpable thrill does not make the access safe for routine ED use.

8. The first 30 minutes

1. Complete ABCDE, full vital signs, oxygen saturation, temperature, mental status, pain score, weight when feasible and bedside glucose. Place unstable or potentially hyperkalaemic patients on continuous cardiac monitoring.
2. Identify dialysis modality, treating unit, usual schedule, last fully completed treatment, reason for interruption, target weight, pre- and post-dialysis weight if known, residual urine, access type and recent access problems.
3. Ask about dyspnoea, orthopnoea, chest pain, weakness, palpitations, syncope, fever, rigors, abdominal pain, cloudy effluent, vomiting, diarrhoea, bleeding, severe pruritus, headache, confusion, seizures and urine change.
4. Obtain a 12-lead ECG and urgent potassium / blood gas. If severe hyperkalaemia or ECG toxicity is suspected, treat before laboratory confirmation when necessary and repeat potassium after temporizing therapy.
5. Establish peripheral IV access in the non-access limb; use IO access if critically ill and peripheral access is delayed. Do not use the fistula / graft or dialysis catheter unless authorized and handled by trained staff.
6. Assess volume clinically and with bedside ultrasound when available. Distinguish shock / hypovolaemia from fluid overload; use small reassessed boluses only when true hypoperfusion is present.
7. Inspect but do not traumatize the access. Check thrill / bruit, bleeding, erythema, drainage, aneurysm, arm / neck swelling, distal warmth, colour, sensation, power and pulses.
8. Contact nephrology / dialysis service early, providing physiology and treatment already given. Activate vascular surgery, critical care, obstetrics, paediatrics or regional transfer in parallel when indicated.
9. Document arrival, recognition, ECG, potassium, calcium / insulin-glucose / NIV / antibiotics / haemorrhage-control times, specialist acceptance, transport activation and serial response.

9. Focused history and examination

Domain	Minimum assessment
Kidney history	Cause of kidney failure, usual creatinine if not dialysis dependent, residual urine, prior transplant, previous hyperkalaemia / overload, dialysis vintage and known access stenosis or infection.
Dialysis prescription	Modality, days / duration, last completed run, ultrafiltration achieved, target weight, dialysate potassium when known, anticoagulation, recent alarms, PD exchanges / last clear effluent and home supplies.
Medicines	Potassium supplements, RAAS blockers, mineralocorticoid antagonists, trimethoprim, NSAIDs, beta-blockers, digoxin, insulin / sulfonylurea, anticoagulant / antiplatelet, phosphate binders, calcimimetic, diuretics and recent antibiotics.
Volume / cardiovascular	JVP, oedema, lung sounds, work of breathing, BP in non-access limb, perfusion, heart sounds / rub, weight versus target, bedside ultrasound, chest pain and arrhythmia.
Access	Type and side; thrill / bruit; puncture sites; bleeding; aneurysm / pseudoaneurysm; erythema / discharge; catheter tunnel; arm / neck / facial swelling; distal neurovascular status.
PD abdomen	Effluent clarity, abdominal tenderness / guarding, exit site and tunnel, hernia / leak, bowel symptoms, recent contamination / disconnection and last antibiotic exposure.
Neurological / uraemic	Cognition, asterixis, headache, weakness, sensory change, seizure, pericarditic pain, bleeding tendency, severe nausea / vomiting and functional baseline.
Context and goals	Reason for missed care, transport / finance / caregiving barriers, home support, direct dialysis contact, transplant status, advance plan, treatment ceiling and preferred receiving centre.

10. Hyperkalaemia and dangerous electrolyte disturbance

- Obtain an urgent ECG and potassium, but recognize that a normal ECG does not exclude dangerous hyperkalaemia and ECG toxicity may occur before a confirmed result. Repeat a haemolysed or unexpected result promptly without delaying treatment when clinical risk is high.
- For severe hyperkalaemia or ECG changes, give IV calcium according to the approved adult / paediatric algorithm to stabilize the myocardium. Repeat ECG and calcium if toxic changes persist or recur. Calcium does not remove potassium.
- Shift potassium intracellularly using the approved insulin-glucose regimen. Check glucose before treatment and at frequent defined intervals for at least several hours because dialysis patients have high delayed-hypoglycaemia risk. Give supplementary glucose according to the protocol.
- Use nebulized beta-agonist as an adjunct, not sole therapy. Sodium bicarbonate is not routine monotherapy but may be considered in selected severe metabolic acidosis under senior / renal guidance.
- Stop exogenous potassium and contributing medicines when clinically appropriate. Review IV fluids, nutrition, transfusion, tissue breakdown, acidosis, constipation and occult bleeding.
- Arrange definitive potassium removal. Potassium binders may support treatment under local policy but do not replace emergency dialysis in unstable or refractory disease.
- Recheck potassium and ECG after treatment and serially because rebound is common. Escalate immediately for dialysis when potassium is severe, rising, recurrent, associated with toxicity, or not controlled by temporizing treatment.
- Assess calcium, magnesium, phosphate and sodium concurrently. Treat symptomatic hypocalcaemia, severe magnesium disturbance, seizures or arrhythmias using the approved pathway with renal advice.

DO NOT DECLARE HYPERKALAEMIA “FIXED” after a single lower repeat value. Temporizing treatment redistributes potassium; it does not remove the body potassium load. Confirm a definitive removal and dialysis plan.

11. Fluid overload, pulmonary oedema and severe hypertension

Step	Standard
Position / oxygenation	Sit upright; titrate oxygen; start CPAP / BiPAP early when appropriate. Escalate for airway support if exhaustion, reduced consciousness or refractory hypoxaemia develops.
Blood pressure / afterload	In hypertensive pulmonary oedema, use rapidly titratable nitrate therapy under the approved pathway. Treat aortic syndrome, ACS and neurological hypertensive emergency when suspected.
Fluids	Do not give routine sepsis-size boluses to an overloaded, anuric patient. If shock is present, use small aliquots with immediate reassessment and early vasopressor / critical-care support.
Diuretics	A loop diuretic may help only when meaningful residual urine remains. Do not delay dialysis or rely on escalating diuretics in anuria.
Dialysis	Contact dialysis service immediately for urgent ultrafiltration / haemodialysis. Continue NIV and haemodynamic stabilization during transfer.
Alternative / concurrent causes	Evaluate ACS, arrhythmia, infection, anaemia, pulmonary embolism, valvular disease, pericardial effusion and non-adherence / access failure.
Monitoring	Continuous ECG and oxygen monitoring, frequent BP, strict fluid balance, serial respiratory examination and response after each intervention.

12. Severe acidosis, uraemic complications and urgent KRT

- Urgent dialysis decisions are based on the whole clinical picture and response to treatment, not a single creatinine, urea or eGFR threshold.
- Immediately involve nephrology / critical care for refractory severe hyperkalaemia; refractory pulmonary oedema / hypoxaemia; severe metabolic acidosis not responding to appropriate treatment; uraemic pericarditis, encephalopathy, seizures or clinically significant bleeding; selected dialysable poisonings; and persistent complications of oliguria / anuria.
- Suspect uraemic pericarditis with pleuritic / positional chest pain, pericardial rub or effusion. Obtain ECG and echocardiography; avoid assuming anticoagulation is safe; obtain urgent renal / cardiology input.
- Uraemic encephalopathy is a diagnosis of exclusion. Check glucose, oxygen, temperature, electrolytes, infection, stroke, seizure, toxins, medications and hypertensive emergency while arranging urgent KRT.
- Correct severe acidosis by treating shock, hypoxia, sepsis, ketoacidosis or toxin exposure. Bicarbonate may be appropriate selectively but can worsen sodium and fluid load; use senior / renal guidance.
- For toxic alcohols, lithium, salicylate and other potentially dialysable poisons, activate Protocol 29, poison-centre / toxicology consultation and nephrology immediately. Do not wait for a drug level when clinical criteria mandate treatment.

13. Missed, shortened or interrupted dialysis

- Determine exactly what was missed: full session, shortened ultrafiltration, access failure, power / water outage, travel, intercurrent illness, refusal or transport / social barrier.
- Assess ABCDE, ECG, potassium, bicarbonate / blood gas, urea / creatinine, calcium / magnesium / phosphate, glucose, FBC, volume status, weight versus target, infection and access function.
- Review all medicines taken since the last dialysis and any high-potassium intake, constipation, bleeding, tissue injury or transfusion. Ask about residual urine and change from baseline.
- Arrange same-day dialysis when clinically required or when the next routine session is not safely adequate. Severe physiology requires emergency transfer, not an outpatient appointment.
- Do not use the absence of symptoms, a normal-looking ECG or a single acceptable potassium to discharge without a confirmed dialysis plan when several sessions were missed or the trajectory is uncertain.
- Address the cause before discharge: transport, finance, caregiving, mental health, health literacy, housing / power, equipment failure, infection-control issue or conflict with the dialysis unit. Escalate recurrent barriers through safeguarding / social-work and renal services.

7. Provide explicit fluid, medication, potassium and return advice without shaming. Document communication with the dialysis centre and the named clinician accepting follow-up.

14. AV fistula / graft haemorrhage and aneurysm

Problem	Emergency approach
Active post-needle bleeding	Apply firm focal pressure with sterile gauze over the puncture site continuously. Do not repeatedly lift to check. Assess anticoagulant use, platelet / coagulation disorder and haemodynamic effect.
Spontaneous / aneurysmal rupture	Activate major haemorrhage; uninterrupted focal pressure and haemostatic dressing; non-access IV / IO; blood products and reversal as indicated; urgent vascular surgery / transfer. A tourniquet is a last-resort life-saving measure only when exsanguinating bleeding cannot otherwise be controlled by trained staff.
Threatened rupture	Thin shiny skin, ulceration, scab, infection, rapid enlargement, pain or recurrent bleeding over an aneurysm / pseudoaneurysm requires urgent vascular review and protection from trauma / cannulation.
After control	Mark / photograph site only with consent and local policy; continue close observation because rebleeding can be catastrophic. Do not discharge without renal / vascular plan and safe dressing instructions.
Do not	Do not apply blind clamps, sutures or circumferential tight bandages; do not cannulate near an aneurysm; do not send a patient with unresolved or recurrent bleeding to routine dialysis transport.

15. Access thrombosis, dysfunction, infection and limb complications

Syndrome	Key actions
Absent / reduced thrill or bruit	Assume thrombosis or critical stenosis until assessed. Protect the access, check distal perfusion, contact renal / vascular service urgently and arrange duplex / intervention. Salvage is time sensitive.
Prolonged bleeding / high venous pressures	May indicate outflow stenosis. Review dialysis records, anticoagulants and access examination; urgent access-team referral even if bleeding has stopped.
Infected fistula / graft	Fever, erythema, tenderness, drainage or pseudoaneurysm: sepsis assessment, blood cultures, renal-adjusted IV antibiotics and urgent renal / vascular review. Avoid cannulating infected tissue.
Steal syndrome / distal ischaemia	Cool painful hand, pallor, paraesthesia, weakness, tissue loss or absent distal pulses: urgent vascular assessment. Acute severe ischaemia is limb threatening.
Venous hypertension / central stenosis	Marked arm, neck, breast or facial swelling, collateral veins or SVC symptoms: protect access, assess airway / thrombosis and obtain urgent renal / vascular imaging advice.
Catheter dysfunction	Do not force flush, use sharp instruments, instill thrombolytic or exchange in the ED without protocol and trained staff. Check clamps / kinks externally and contact dialysis service.
Catheter dislodgement / break	Clamp intact external segment if trained and safe; control bleeding / air entry; cover with occlusive sterile dressing; position and resuscitate according to physiology; urgent renal / vascular / interventional help.

16. Dialysis catheter infection and bloodstream sepsis

- Suspect catheter-related bloodstream infection with fever, rigors during or after dialysis, hypotension, unexplained deterioration, exit-site / tunnel inflammation or no alternative source.
- Obtain peripheral blood cultures and catheter-lumen cultures when feasible, safe and performed by trained staff. Do not delay antibiotics in sepsis or shock.
- Give immediate empiric IV antibiotics covering locally prevalent Gram-positive organisms, including MRSA when indicated, and Gram-negative organisms; adjust for dialysis and prior microbiology.
- Do not automatically remove a tunnelled catheter in the ED. Urgent removal / exchange decisions depend on shock, tunnel infection, persistent bacteraemia, *S. aureus*, *Pseudomonas*, fungal infection, metastatic infection and access options; involve nephrology / infectious diseases.
- Assess for endocarditis, septic emboli, vertebral infection and access thrombosis when symptoms or organism warrant. Document whether the catheter was accessed, by whom and using what aseptic technique.
- Use contact / transmission-based precautions according to the suspected pathogen and local infection-control policy.

17. Peritoneal-dialysis peritonitis and catheter complications

Step	Standard
Recognize	Cloudy effluent is peritonitis until excluded, even with little pain. Also ask about fever, abdominal pain, nausea, diarrhoea, recent contamination, constipation, procedure, exit-site infection and prior antibiotics.
Sample	Before antibiotics when this causes no harmful delay, send fresh effluent for cell count, differential, Gram stain and culture using the local blood-culture-bottle method. Label dwell time and antibiotic exposure.
Treat	Give prompt empiric Gram-positive and Gram-negative coverage under the local PD protocol. Intraperitoneal therapy is preferred for stable patients when trained staff and correct dosing are available; use systemic IV therapy for sepsis, shock or when IP treatment cannot be delivered promptly.
Assess abdomen	Generalized guarding, haemodynamic instability, very high inflammatory burden, polymicrobial / enteric organisms, severe diarrhoea, free air or poor response raises concern for surgical intra-abdominal pathology; obtain urgent imaging and surgery review.
Exit-site / tunnel infection	Inspect for purulent drainage, erythema, pain and tunnel tenderness; swab drainage and involve PD team. Concomitant infection may require catheter removal.
Technique / contamination	Do not improvise exchanges without trained staff. Preserve connections and supplies, document breach, and contact the PD service for prophylaxis / exchange instructions.

Step	Standard
Follow-up	Admit unstable, paediatric, high-risk, unreliable or severe cases. Stable outpatient management requires direct PD-team acceptance, antibiotics in hand, training and next-day review. Discuss antifungal prophylaxis under the local renal protocol when an antibiotic course is prescribed.

18. Complications during or immediately after haemodialysis

Event	Immediate actions
Intradialytic hypotension / cramps	Stop or reduce ultrafiltration through dialysis staff; supine position; assess bleeding, sepsis, ACS, arrhythmia and excessive fluid removal; cautious small-volume saline only when indicated; reassess target weight and medicines.
Dialyzer / anaphylactoid reaction	Stop dialysis; severe reaction requires that blood in the circuit not be returned; manage airway, adrenaline and shock under Protocol 30; document membrane / sterilitant / medications and inform dialysis unit.
Haemolysis	Suspect chest / back pain, dyspnoea, dark blood in circuit, hyperkalaemia or abrupt deterioration. Stop dialysis and do not return circuit blood; treat hyperkalaemia, anaemia and shock; urgent nephrology / critical care.
Air embolism	If still connected, trained dialysis staff stop pump and clamp lines. Give high-flow oxygen, ABCDE, urgent critical-care and nephrology support; evaluate neurological / cardiopulmonary injury.
Dialysis disequilibrium	Headache, nausea, restlessness, confusion or seizure during / after initial or intensive dialysis: stop or slow dialysis under nephrology; seizure / airway care; glucose and urgent exclusion of stroke, haemorrhage, infection and severe BP disturbance.
Pyrogenic reaction / rigors	Treat as sepsis until proved otherwise; cultures, antibiotics and dialysis-system investigation. Do not assume a benign membrane reaction.
Post-dialysis syncope / chest symptoms	Assess arrhythmia, ACS, rapid volume removal, electrolyte shift, bleeding, pulmonary embolism and autonomic hypotension. Compare pre/post weights and dialysis record.

19. Medicines, investigations and diagnostic interpretation

Domain	Safety standard
Core tests	ECG; glucose; electrolytes including potassium, bicarbonate, calcium, magnesium and phosphate; urea / creatinine; FBC; blood gas; coagulation; cultures; group and screen when bleeding. Add troponin, CK / LDH / haptoglobin, drug levels or imaging as indicated.
Potassium sample	Repeat haemolysed or discordant values urgently. A point-of-care result may guide treatment, but confirm and trend through the approved laboratory process.
Cardiac biomarkers	Troponin and natriuretic peptides may be chronically elevated; interpret symptoms, ECG, serial change, echo and baseline. Chronic elevation never excludes acute coronary syndrome or overload.
Renal dosing	Use a current renal / dialysis dosing reference and pharmacist. Consider loading doses, dialysis timing, protein binding and post-dialysis supplementation.
Avoidable hazards	Avoid potassium-containing supplements / fluids when hyperkalaemic; magnesium- or aluminium-containing antacids / laxatives, phosphate enemas and unreviewed nephrotoxins; avoid IM injections when bleeding risk is high.
Analgesia / sedation	Use locally approved renal-safe choices and reduced / extended dosing where needed. Accumulating opioid metabolites and gabapentinoids can cause delayed respiratory or neurological toxicity.
Contrast imaging	Do not delay life-saving contrast imaging solely because of kidney failure. Clarify residual kidney function, volume and dialysis plan; urgent dialysis solely to remove routine contrast is not automatically required.
Fluid prescriptions	Every IV fluid order must state indication, type, volume, rate and reassessment. Include antibiotics, glucose infusions and drug carriers in the total balance.

20. Paediatric, pregnancy and vulnerable-patient considerations

- Children require weight-based treatment, age-specific observations, paediatric ECG interpretation, strict fluid calculation and early paediatric nephrology / critical-care contact. Dialysis and access procedures should occur in a paediatric-capable centre whenever possible.
- In pregnancy, involve obstetrics and nephrology early. Distinguish fluid overload and renal hypertension from pre-eclampsia / eclampsia, and avoid maternal hypotension that compromises uteroplacental perfusion. Dialysis prescriptions may require increased frequency.
- Older adults and patients with frailty may present with falls, delirium, weakness or poor intake rather than classic overload or infection. Compare cognition, function and target weight with baseline.
- Patients with limited health literacy, cognitive impairment, disability, unstable housing, transport barriers or recurrent missed dialysis require supported communication, caregiver involvement with consent, social-work input and a realistic access-to-care plan.
- For patients with a conservative kidney-management plan or treatment ceiling, provide active symptom control, clarify whether dialysis remains within goals, involve palliative care and never equate non-dialysis care with non-treatment.

21. Observation and senior reassessment

Requirement	Standard
Frequency	Continuous monitoring when unstable or after IV calcium / insulin-glucose; otherwise documented repeat observations and clinical review at intervals matched to risk.
After hyperkalaemia treatment	Repeat ECG, potassium and glucose on the approved schedule; monitor for recurrent ECG toxicity, rebound potassium and delayed hypoglycaemia.

Requirement	Standard
After respiratory treatment	Repeat work of breathing, oxygen, BP, lung findings and NIV tolerance; do not delay dialysis transfer while awaiting complete radiographic resolution.
After haemorrhage control	Continuous site observation, serial haemodynamics and haemoglobin as indicated; reassess dressing without repeatedly disrupting the clot.
After antibiotics	Repeat perfusion, mental status, lactate / organ function and access / abdomen; document cultures and dose timing relative to dialysis.
Decision point	A senior clinician confirms whether urgent dialysis, vascular intervention, admission, observation, outpatient dialysis or transfer is required and documents the physiological rationale.

22. Admission, critical care and transfer

- Admit or transfer patients with severe / recurrent hyperkalaemia, pulmonary oedema, hypoxia, shock, severe hypertension with organ injury, acidosis, uraemic neurological / pericardial complications, sepsis, active or recurrent access bleeding, access ischaemia, catheter dislodgement, severe PD peritonitis, uncertain dialysis access or inability to secure timely dialysis.
- Critical care is required for airway or ventilatory failure, vasopressor need, malignant arrhythmia, refractory electrolyte disturbance, severe neurological deterioration, major haemorrhage or multi-organ failure.
- Initiate transfer as soon as the need is recognized. Send ECGs, serial laboratory results, medication times, fluid balance, access details, dialysis prescription / last run, cultures, imaging and goals-of-care information.
- During transport, continue cardiac / oxygen monitoring as indicated, secure haemorrhage dressings and catheters, carry rescue glucose after insulin treatment, and ensure staff can manage recurrence of hyperkalaemia, pulmonary oedema or bleeding.
- When dialysis cannot occur promptly because of weather, transport, utility or equipment failure, activate Protocol 57 and executive escalation. Continue temporizing treatment, serial testing and critical-care support; do not leave the patient in an unmonitored holding state.

23. Safe discharge and outpatient dialysis

- Discharge is appropriate only when life-threatening complications are excluded or corrected, observations and ECG are stable, potassium / glucose have been safely trended, access is usable or a clear alternative exists, and a named dialysis clinician accepts the plan.
- Confirm date, time, place and transport for the next dialysis or PD review. "Return to your unit" without direct communication is not an adequate plan.
- Provide written instructions on fluid, medicines, potassium, dressing / access protection, PD effluent and symptoms requiring immediate return. Use teach-back with the patient and caregiver.
- Do not discharge active / recurrent access bleeding, unresolved hypoxia, suspected catheter bacteraemia, severe PD peritonitis, ongoing neurological symptoms, inability to obtain medicines, or unreliable access to urgent review.
- Assign a named owner for pending cultures, repeat potassium, imaging and blood results. Record how the patient will be contacted and what action thresholds apply.

24. Documentation and handover

Must document	Minimum content
Dialysis status	Modality, unit, schedule, last completed treatment, target / current weight, residual urine, access type / side and reason for missed or interrupted dialysis.
Physiology	Serial vital signs, ECG interpretation, potassium / glucose / blood-gas trends, oxygen / NIV, fluid balance, urine and neurological status.
Access	Thrill / bruit, bleeding site, aneurysm, infection, distal perfusion, dressings, catheter condition and any manipulation / access by staff.
Treatment times	IV calcium, insulin-glucose, beta-agonist, nitrates, NIV, antibiotics, haemorrhage control, reversal, specialist contact, dialysis request, acceptance and departure.
Decision	Urgent KRT indication or rationale against it, reassessment response, goals of care, capacity / refusal, transfer risk and senior review.
Handover	Problem list, trajectory, treatment and response, dialysis prescription / access needs, medication timing, cultures / pending results, monitoring and contingency plan.

25. Quality indicators and audit

Indicator	Suggested measure
Severe hyperkalaemia	Time from recognition / ECG toxicity to IV calcium and insulin-glucose; proportion with repeat potassium, ECG and complete glucose monitoring.
Urgent dialysis	Time from recognized indication to nephrology contact, acceptance, transfer departure and KRT start; reasons for delay.
Pulmonary oedema	Proportion receiving early NIV / appropriate nitrate therapy and documented fluid assessment; avoidable large fluid boluses.
Access haemorrhage	Time to uninterrupted pressure and major-haemorrhage activation; rebleeding, transfusion, access loss and mortality.
Access protection	Incidents of BP, venepuncture, IV placement or unauthorized cannulation in fistula / graft limb.
PD peritonitis	Time to effluent sampling and empiric antibiotic; culture yield, admission, catheter removal and transfer delay.
Medication safety	Renal / dialysis dosing errors, post-insulin hypoglycaemia, contraindicated magnesium / phosphate products and omitted post-dialysis doses.

Indicator	Suggested measure
Equity / access	Repeat presentations and missed dialysis linked to transport, finance, housing, caregiving, disability or service failure; documented mitigation.

26. Training and implementation

- Annual simulation: severe hyperkalaemia with recurrent ECG changes and delayed hypoglycaemia.
- Annual simulation: catastrophic AV fistula / graft haemorrhage and transfer activation.
- Competency training: access-limb protection, dialysis catheter asepsis, PD effluent sampling, NIV and renal medicine dosing.
- Joint ED-dialysis review of all access losses, severe hyperkalaemia delays, PD peritonitis delays, dialysis transfer failures and deaths.
- Patient-facing education co-designed with the dialysis population on emergency access bleeding, missed dialysis and when to seek urgent care.

27. Local configuration before approval

- ☐ 24/7 nephrology / dialysis / paediatric nephrology contact and escalation tree inserted.
- ☐ Local severe-hyperkalaemia algorithm, adult / paediatric doses and glucose-monitoring schedule attached.
- ☐ Nearest emergency dialysis centres, acceptance process, transport mode and weather / ferry / aircraft contingencies listed.
- ☐ Access bleeding kit location, vascular-surgery / interventional-radiology contact and major-haemorrhage process confirmed.
- ☐ PD effluent collection, laboratory handling and empiric IP / IV antibiotic protocol approved.
- ☐ Haemodialysis catheter access and culture competency defined; unauthorized access prohibited.
- ☐ Renal / dialysis medicine dosing reference and pharmacy support available 24/7.
- ☐ Local target for time to nephrology contact, transfer and dialysis start agreed and auditable.
- ☐ Utility / water / oxygen / dialysis-machine downtime plan integrated with Protocol 57.
- ☐ Conservative kidney management, treatment ceilings and palliative-care pathway embedded.

28. Source guidance for local adaptation

Source	Key use in this protocol
UK Kidney Association. Clinical Practice Guideline: Management of Hyperkalaemia in Adults. 2023.	Emergency ECG assessment, IV calcium, insulin-glucose, adjunctive treatment, glucose surveillance, repeat potassium and escalation.
NICE. NG148: Acute Kidney Injury - Prevention, Detection and Management. Published 2019; updated 2024.	AKI assessment, cause identification, immediate specialist referral and KRT transfer principles.
KDIGO. Clinical Practice Guideline for Acute Kidney Injury. 2012; update in public review during 2026.	Physiology-based KRT initiation, access / modality principles and avoidance of single-number thresholds.
KDIGO. Blood Pressure and Volume Management in Dialysis: Controversies Conference Report. 2020.	Volume assessment, target weight, ultrafiltration and dialysis-related hypotension / overload principles.
International Society for Peritoneal Dialysis. Peritonitis Guideline Recommendations: 2022 Update.	Cloudy effluent pathway, diagnostic sampling, empiric coverage, IP therapy and catheter / outcome considerations.
International Society for Peritoneal Dialysis. Catheter-related Infection Recommendations: 2023 Update.	Exit-site and tunnel infection recognition, microbiology, treatment and catheter decisions.
National Kidney Foundation KDOQI. Clinical Practice Guideline for Vascular Access: 2019 Update.	AV access protection, stenosis / thrombosis, aneurysm, bleeding, infection and access-life planning.
UK Kidney Association. Clinical Practice Guideline - Haemodialysis. 2019.	Haemodialysis complications, prescription safety and dialysis-service standards.
Local protocols and formularies	Paediatrics, pregnancy, sepsis, hyperkalaemia doses, anticoagulant reversal, transfusion, vascular intervention, toxicology, critical care, palliative care and inter-island / regional transfer.

Annex A. One-page renal and dialysis emergency workflow

Stage	Action
1. Identify	Dialysis modality, schedule, last completed treatment, target weight, residual urine, access type / side, treating centre and goals of care.
2. Recognize danger	ABCDE; ECG; screen for hyperkalaemia, pulmonary oedema, shock / sepsis, access bleeding / failure, PD peritonitis, uraemic complications and severe hypertension.
3. Protect access	NO BP / NO NEEDLES / NO IV in fistula / graft limb. Dialysis catheter handled only by trained authorized staff.
4. Treat immediately	IV calcium and potassium shift when indicated; oxygen / NIV / nitrate for overload; focal pressure and major haemorrhage care; antibiotics for sepsis / PD peritonitis.
5. Investigate	Potassium, glucose, blood gas, renal profile, calcium / magnesium / phosphate, FBC, coagulation, cultures, ECG and targeted imaging.
6. Contact specialists	Nephrology / dialysis early; add critical care, vascular / interventional, surgery, paediatrics or obstetrics as required.
7. Reassess	Serial ECG, potassium, glucose, oxygen, BP, mental status, bleeding site, access flow, fluid balance and response.
8. Dialyse / transfer / dispose safely	Urgent KRT based on physiology and trajectory. Discharge only with named dialysis acceptance, transport, written warnings and pending-result owner.

Annex B. Severe hyperkalaemia bundle

- ☐ Continuous cardiac monitoring and 12-lead ECG completed; time _____.
- ☐ Potassium / blood gas sent and sample quality reviewed; result _____ mmol/L.
- ☐ IV calcium given for ECG toxicity / severe disease according to local algorithm; time _____; repeat ECG documented.
- ☐ Insulin-glucose administered at _____; pre-treatment glucose _____ mmol/L.

- ☐ Glucose monitoring ordered at local required intervals through _____; supplementary glucose plan documented.
- ☐ Nebulized beta-agonist / selective bicarbonate / potassium-removal adjuncts considered under protocol.
- ☐ Potassium sources and contributing medicines stopped / reviewed.
- ☐ Repeat potassium at _____ and _____; rebound risk acknowledged.
- ☐ Nephrology / dialysis contacted at _____; accepted at _____; KRT / transfer time _____.
- ☐ Patient remains monitored until definitive potassium removal and safe trajectory are confirmed.

Annex C. Dialysis access bleeding checklist

- ☐ Major haemorrhage / resuscitation response activated when appropriate.
- ☐ Firm uninterrupted focal pressure applied with sterile gauze / haemostatic dressing; start time _____.
- ☐ No repeated lifting, blind clamp, tight circumferential wrap or routine cannulation.
- ☐ Non-access IV / IO established; bloods, group and screen / crossmatch sent.
- ☐ Anticoagulant / antiplatelet / heparin exposure and reversal indication reviewed.
- ☐ Haemodynamics, distal perfusion and access aneurysm / infection assessed.
- ☐ Vascular surgery / interventional radiology and nephrology contacted at _____.
- ☐ Rebleeding surveillance and transport dressing plan documented.
- ☐ Blood products / massive transfusion initiated if required.
- ☐ Receiving centre, transport and access-salvage plan confirmed.

Annex D. Suspected PD peritonitis bundle

- ☐ Cloudy effluent / pain / fever / contamination history and last clear exchange documented.
- ☐ ABCDE, sepsis screen, glucose and abdominal / exit-site / tunnel examination completed.
- ☐ Fresh PD effluent sent for cell count, differential, Gram stain and culture; dwell time recorded.
- ☐ Blood cultures obtained when febrile / systemically unwell without delaying antibiotics.
- ☐ Empiric Gram-positive and Gram-negative antibiotics given by approved IP / IV route at _____.
- ☐ Renal / PD team contacted at _____; dose and exchange instructions confirmed.
- ☐ Surgical abdomen, polymicrobial / enteric source, hernia, leak and obstruction considered.
- ☐ Antifungal prophylaxis requirement reviewed under local policy.
- ☐ Admission versus direct PD-team outpatient plan accepted by named clinician.
- ☐ Next review, antibiotic supply, technique support and culture-result owner documented.

Annex E. Urgent dialysis indication and transfer checklist

Indication / risk	Evidence and action
Hyperkalaemia	Severe, ECG-toxic, rising, recurrent or refractory despite temporizing treatment. Continue monitoring and treatment during transfer.
Fluid overload	Pulmonary oedema / hypoxia refractory to medical therapy, especially anuria or inability to tolerate fluids. NIV / nitrate and urgent ultrafiltration.
Acidosis	Severe metabolic acidosis with instability or inadequate response to cause-directed therapy.
Uraemia	Pericarditis, encephalopathy / seizure, clinically significant bleeding or severe persistent symptoms attributable to uraemia.
Toxin / solute	Selected dialysable poisoning or severe refractory electrolyte / metabolic complication after toxicology-nephrology discussion.
Transfer readiness	Receiving nephrologist, modality / access plan, transport, monitoring, rescue medicines, laboratory / ECG trends and treatment ceiling confirmed.

Annex F. Renal emergency discharge / transfer checklist

- ☐ Final diagnosis, residual uncertainty and urgent KRT indications considered are documented.
- ☐ Vital signs, oxygenation, mental status, ECG and access status are stable for chosen disposition.
- ☐ Latest potassium, glucose after insulin, blood gas and other critical results reviewed and trended.
- ☐ Nephrology / dialysis clinician agrees with discharge or receiving clinician accepts transfer.
- ☐ Next dialysis / PD review date, time, location and transport are confirmed.
- ☐ Written fluid, medicine, potassium, access / dressing and return instructions provided with teach-back.
- ☐ Cause of missed dialysis or recurrent presentation addressed with practical support.
- ☐ Pending cultures / imaging / blood results have a named owner and contact method.
- ☐ Transfer handover includes last dialysis, target weight, access, treatment times, trends, fluid balance and goals of care.
- ☐ Any refusal / departure before completion includes capacity assessment, informed risk discussion and harm-reduction plan.

END OF PROTOCOL 47 - DRAFT 1.0 FOR LOCAL MULTIDISCIPLINARY VALIDATION