UKKA
UK Kidney Association

Acute Kidney Injury National Summit

Report and Recommendations

UKKA
UK Kidney Association

Endorsed By

Association of Nephrology Nurses UK
BRITISH SOCIETY FOR HEART FAILURE
Intensive Care Society
Association for Laboratory Medicine
sam
Royal College of Physicians
UK NEQAS Clinical Chemistry
UKRPG UK Renal Pharmacy Group
BGS British Geriatrics Society Improving healthcare for older people

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Foreword

This report presents a series of recommendations first proposed following a National Acute Kidney Injury (AKI) Summit held in Birmingham, in September 2023. The recommendations and supporting rationale were subsequently finalised for this report, by a writing group comprising 33 multi-professionals who presented and / or led workshops at the AKI summit, to ensure overall consensus and alignment of recommendations.

The summit and report were led by the UK Kidney Association (UKKA) in partnership with other key stakeholder organisations, including The Royal College of Physicians (RCP), the Society for Acute Medicine (SAM), the British Society for Heart Failure (BSH), the Intensive Care Society (ICS), the Association of Nephrology Nurses (ANN UK), UK Renal Pharmacy Group, British Geriatric Society (BGS), Association for Laboratory Medicine and UK National External Quality Assessment Services (UK NEQAS) Clinical Chemistry. Ensuring such healthcare system-wide representation and relevance underlines a key overarching aim of the summit and this report; AKI, like sepsis, represents a huge and serious system-wide patient safety risk. Addressing a whole population healthcare priority requires solutions that are standardised, aligned and implemented system-wide. Success requires system-wide collaborative engagement, similar to the 'surviving sepsis campaign', across care sectors, specialties and multi-professionals. Renal services only look after seven per cent of all people with AKI (Selby et al, 2012).

Another key aim of the summit and this report was to ensure holistic focus upon high-risk patients and healthcare services, rather than just kidneys and blood test results. It is increasingly recognised that people at risk of AKI represent patient populations that are at overall high risk of acute deterioration and other serious adverse outcomes, if they become unwell or require surgery, for example. Safe and quality AKI care for these high-risk populations usually requires management of common long-term health conditions which are associated with increased risk of AKI, such as heart failure, diabetes and chronic kidney disease (CKD). Improving long term health and minimising acute safety risks for such people requires diligent, joined-up and timely medicines and fluid management, especially for patients with frailty or other complex health and social needs.

The National AKI Summit was attended by 120 multidisciplinary healthcare professionals with diverse, healthcare system-wide experience and expertise in AKI care. Patient and healthcare priority problems for AKI care were presented in the morning and proposed solutions discussed by delegates within nine interactive workshops in the afternoon. The *Summary of Recommendations* listed below reflect those proposed during or following the workshops, subsequently collated and shared by workshop leads within a post-summit multi-professional writing group to ensure overall consensus and alignment. Similarly, the *Rationale for Recommendations* (documented below) summarises workshop themes and discussion reported by workshop leads, together with supporting literature, evidence, guidelines, toolkits and example solutions, collated and agreed by the post-summit multi-professional writing group.

The recommendations in this report aim to address national patient-centred and healthcare service priorities for AKI care. The report focuses upon holistic care for high-risk populations and is relevant to multi-professionals in all healthcare settings, plus system-wide healthcare commissioners and providers.

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Summary of Recommendations

AKI: National Data & Measurement

01 NHS Hospital laboratories should follow National Recommendations (NHSE 2014 & NICE 2023) to standardise the laboratory AKI warning system.

02 The National Commissioning Data Repository (NCDR) AKI dashboard and UK Renal Registry (UKRR) AKI portal should be used by the 42 NHS Integrated Care Boards, to support AKI improvement and commissioning.

AKI: Healthcare professional awareness, competence & confidence

03 All healthcare staff should be aware that AKI is a system-wide patient safety priority and an acute marker of patient deterioration. They should be able to recognise and respond to patients at risk of AKI or who have confirmed AKI.

04 AKI recognition and response should be a core generic capability for all healthcare professionals; continuing professional development, undergraduate and postgraduate training should reflect this for all healthcare professionals.

AKI: Coordination of care in patients with long term conditions

05 People with AKI have higher overall clinical risk, requiring prompt assessment. Clinical responsibility for patients with AKI stage 2 or 3 should be explicit, including during transitions of care.

06 AKI care should be personalised and aligned with management of other acute illness and chronic disease, coordinated by responsible senior decision makers.

Think Heart: Renin–angiotensin–aldosterone (RAAS) inhibitor therapy, heart failure & AKI

07 RAAS inhibitor medication (e.g. angiotensin converting enzyme inhibitors, or ACEi) should not be termed "nephrotoxic", as this risks patients and healthcare professionals misunderstanding their overall long-term benefit.

08 Criteria for suspending and restarting RAAS inhibitor medication should be personalised, thoughtfully considered and clearly recorded. Whenever possible, decision-making should be shared with patients and communicated promptly to relevant healthcare professionals, especially during transitions of care.

09 Early reinitiation of RAAS inhibitor therapy after AKI may confer benefit, especially for people with heart failure with reduced ejection fraction, where discharge from hospital without RAAS inhibitors carries higher risk for mortality and readmission.

10 Hyperkalaemia is a medical emergency, requiring prompt action supported by readily accessible up-to-date local guidelines. If RAAS inhibitors are suspended these should be restarted, once hyperkalaemia is under control and clinically appropriate. Potassium binders may allow RAAS inhibitors to be continued in moderate hyperkalaemia with no ECG changes.

Patient care & safety: fluid & medicines

11 Multidisciplinary teams should proactively identify people at risk of dehydration and implement interventions, in partnership with their family and carers, to ensure that they maintain adequate intake of oral fluids, to reduce their risk of AKI.

12 Intravenous fluids (IVF) should not be a default treatment for all patients with AKI. Prescription of IVF should be guided by clinical examination, with regular review and recognition of when to de-escalate / stop, as per NICE guidance for intravenous fluid therapy in adults in hospital.

13 Diuretic therapy is not contraindicated in AKI associated with fluid overload. It may improve renal function if AKI is driven by renal congestion, as can occur in heart failure.

14 All medications should be reviewed in patients with AKI and, if necessary, dose adjusted or suspended to mitigate medication-related patient safety risks. As AKI resolves it is important to review medications again with a plan to restart medications or readjust doses where appropriate.

15 While sick-day advice is commonly used to try to mitigate AKI during acute illness episodes, there is no evidence that this is beneficial for RAAS inhibitors and mineralocorticoid receptor antagonists (MRAs) and it may risk overall harm if applied inappropriately.

16 Decision-making regarding use of iodinated contrast media (iodinated CM) in patients at risk of AKI should be led by the clinical team responsible for their care. It should be personalised and shared with patients, when clinically appropriate. Renal referral to discuss routine use of Iodinated CM is not usually necessary.

17 Decision-makers should aim to minimise delays in iodinated CM use that are likely to be clinically significant, recognising a causal role for Iodinated CM in the development of AKI is frequently overestimated.

AKI in hospital: organisation of care

18 NHS Hospital services and care should be organised and audited to limit avoidable adverse patient outcomes and service use associated with AKI. These include high mortality, length of stay, critical care use, and emergency readmission.

19 Acute NHS Hospitals should consider establishing multi-professional AKI teams to support and maintain timely and hospital-wide AKI care.

Standardising safe and timely interhospital patient transfer

20 Local guidelines for renal referral and standards for safe and timely interhospital patient transfer should be agreed and implemented.

21 Clinically approved patient transfer to a renal centre should occur within 24 hours of approval by the receiving renal consultant. Compliance should be audited. Safe repatriation of patients following recovery from AKI should be timely and planned.

Safe & timely post-discharge care

22 Senior decision-makers responsible for the care of patients hospitalised with AKI should agree who is responsible for their care post-discharge, and share this with patients and their carers.

23 Decision-making regarding timeliness, setting and composition of post-discharge care should be holistic and personalised, aiming to stabilise long-term health conditions and minimise adverse outcomes, such as unplanned readmission.

24 AKI discharge documentation must be clear and timely. It must state the cause of AKI and the post-discharge care plan, including if or when to restart any medication suspended at the time of AKI.

Rationale for Recommendations

AKI: National Data and Measurement

1. **NHS Hospital laboratories should follow National Recommendations (NHSE 2014 & NICE 2023) to standardise the laboratory AKI warning system.**

   NHS England issued a Patient Safety Alert in 2014 to standardise nationwide laboratory-based detection, alerting and reporting of AKI. However, Getting It Right First Time (GIRFT) Renal and Pathology teams subsequently found significant, unwarranted nationwide variation in AKI detection, alerting and reporting, in 2021; further investigation found laboratory methodological differences, including creatinine assay and AKI algorithm used, likely contributed significantly to such national variation (Marrington et al, 2023). For example, one in four laboratories did not use enzymatic assays to measure serum creatinine (recommended within NICE CKD Guidelines [NG 203], 2021 and UKKA Safety Alert, 2023) and just one in three laboratories knew if their Laboratory Information Management System (LIMS) used the correct NHS England AKI algorithm (mandated within the 2014 Patient Safety Alert). There was also wide variation in how laboratories report AKI warning stage alerts to clinical teams and to the UK Renal Registry. Laboratories and suppliers of Laboratory Informations Systems (LIMS) should follow national recommendations to eliminate such variation.

2. **The National Commissioning Data Repository (NCDR) AKI dashboard and UK Renal Registry (UKRR) AKI portal should be used by the 42 NHS Integrated Care Boards, to support AKI improvement and commissioning.**

   AKI is a heterogeneous clinical and biochemical syndrome that affects a wide variety of people. AKI data (incidence, outcome, and service use) must therefore be interpreted with caution and caveats, especially if comparing AKI data across different patient populations or care providers.

   The UK Renal Registry (UKRR), in collaboration with the National Think Kidneys Programme, was the first body to systematically collect national AKI data within a Master Patient Index, (MPI, since 2016), and present this as a national AKI data portal (since 2021). It uses AKI warning stage test results reported by hospital laboratories to the UKRR (as mandated by the NHS England AKI Patient Safety Alert in 2014) to provide AKI rates and demographic information for the 42 integrated Care Boards (ICBs) in England. This underlines the imperative for hospital laboratories to adhere to national recommendations to standardise AKI data and reporting (see recommendation 1).

   National AKI e-Alert data are curated by UKRR and it is these data that are the source for the NCDR analyses. The UKRR AKI Data Portal contains user-friendly, graphically presented, snapshot and longitudinal data on AKI incidence, on an ICB or laboratory footprint. Incidence data can be filtered by age, AKI alert level and deprivation quintile and can be age/sex adjusted if this is desired. This portal is valuable to clinicians and public health professionals and should be considered complementary to NCDR. They are not linked to hospital episode data at present.

The NCDR AKI dashboard (login required) links UKRR AKI MPI data with Hospital Episode Statistics (HES) and Secondary Uses Service (SUS) data. It was developed alongside a national AKI Toolkit by the NHSE Renal Service Transformation Programme (https://future.nhs.uk/RSTP, 2023), to support AKI quality improvement (QI) and commissioning, by enabling ICBs and providers to monitor and analyse their longitudinal AKI outcome and service use data, including:

01	02	03	04	05	06
Incidence of hospitalised AKI	Proportion of patients with hospitalised AKI admitted to critical care	Emergency readmission rate in patients with hospitalised AKI	Emergency readmission rate with a cardiovascular cause in patients with hospitalised AKI	Inpatient and 30-day post discharge mortality rate in hospitalised AKI	Median Length of Stay for all patients with hospitalised AKI

These NCDR dashboard metrics are not case-mix adjusted and this must be considered when comparing different hospitals or populations, though this is less relevant for *individual* hospitals or ICB analysis of longitudinal AKI data and service use, for QI purposes.

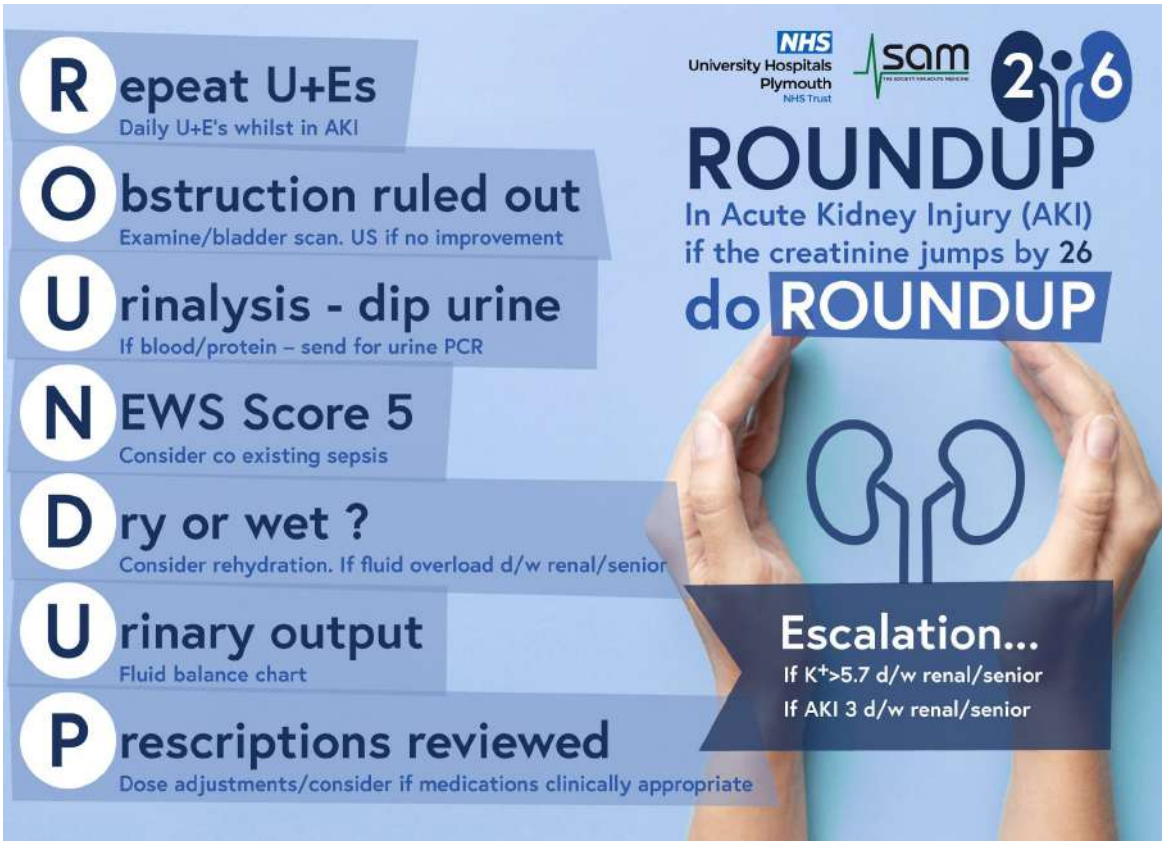
AKI: Healthcare professional awareness, competence & confidence

3. **All healthcare staff should be aware that AKI is a system-wide patient safety priority and an acute marker of patient deterioration. They should be able to recognise and respond to patients at risk of AKI or who have confirmed AKI**

   Patients at risk of AKI are also at risk of acute deterioration if they develop an acute illness or undergo surgery. The onset of AKI can occur in any healthcare setting, and often heralds the onset of acute deterioration. AKI is a system-wide marker of patient risk and acute illness severity. AKI risk and onset should thus be used alongside NEWS2, and clinician, patient or family concerns as part of the clinical assessment to help determine the best location and intensity of patient care required. Accordingly, all healthcare staff should be aware of AKI risk and its relevance. They should be able to recognise and respond to AKI risk and onset, in line with NICE AKI guidelines (NICE Clinical Guideline 148, 2023), and those produced by the UK Kidney Association (UKKA AKI Clinical Practice Guidelines, 2019), NHSE Renal Service Transformation Programme (RSTP AKI Toolkit, 2023) and Royal College of General Practitioners (RCGP AKI Toolkit, 2019)

   Acute NHS hospitals should consider utilising simple AKI resources to help ensure essential processes of AKI care in hospital are completed consistently and promptly, such as ROUND-UP 26 (figure 1) or STOP AKI, to support consistent AKI training for healthcare multi-professionals and undergraduates (as per recommendation 4).

Figure 1: *Example resource to support safe and timely AKI care (ROUND-UP 26). Used with permission from the Society for Acute Medicine and original author.*



4. AKI recognition and response should be a core generic capability for all healthcare professionals; continuing professional development, undergraduate and postgraduate training should reflect this for all healthcare professionals.

All health care professionals should be competent and confident to recognise and respond to AKI as a common and serious patient safety risk, similar to sepsis and thromboembolic disease. This is essential to reduce whole population harm and the systemwide service demands associated with AKI. Similar to other common and serious patient safety risks, patients at risk of AKI commonly present to healthcare professionals across all care sectors, specialties, and professions; only seven per cent of all AKI cases are primarily managed by renal services.

Whilst it is imperative that AKI is recognised as a priority, generalist problem for all healthcare professionals, many healthcare staff and undergraduates report that they feel less confident managing AKI than other common patient safety risks, such as sepsis (Muniraju et al, 2012 and (Murray et al., abstract P055, UK Kidney Week 2018). AKI care should therefore be a core competency for generalist healthcare professionals and undergraduates; continuing professional development, induction programmes, undergraduate and postgraduate curricula should reflect this.

Many newly qualified healthcare professionals will encounter patients at risk of AKI early in their careers, underlining the need to ensure that undergraduates feel adequately prepared to deliver timely and effective AKI care by the end of their training. Newly qualified staff are often assigned roles that underlie prompt AKI recognition (e.g. checking blood results, measuring blood pressure and urine output) and underpin safe AKI care (e.g. prescribing and delivering medications and fluid).

Conventional undergraduate teaching has focused upon "complex" renal diseases, with less pragmatic emphasis upon AKI. Educational methods used to support pragmatic learning for other acute medical priorities, such simulation-based training, may help ensure healthcare undergraduates feel confident and well prepared to deliver timely and effective AKI care soon after their qualification. Undergraduate learning should also complement and support hospital AKI induction and care resources, such as ROUND-UP 26 (see recommendation 3). As AKI presentations are extremely heterogeneous, such training should emphasise that one size does not fit all for people with AKI; whilst checklists may be used to assist clinical assessment this should not replace thoughtful clinical review.

AKI: Coordination of care in multimorbid patients.

5. **People with AKI have higher overall clinical risk, requiring prompt assessment. Clinical responsibility for patients with AKI stage 2 or 3 should be explicit, including during transitions of care.**

   AKI frequently represents a *marker* of acute illness *severity*. It complicates acute illness, worsening patient outcomes, service demand and treatment costs. The association with adverse outcomes worsens with increasing AKI stage and persists system-wide, including in community settings. Its presence is independently associated with marked increases in:

mortality and morbidity	length of hospital stay	critical care service use	emergency readmission following hospital discharge
01	02	03	04

   Clinical responsibility must thus be clear for these high-risk patients, and early clinical reviews are needed upon recognition of AKI risk or onset, to mitigate adverse patient outcomes and inefficient service use. Responsibility should include timely advanced care planning, mindful that many patients with AKI are at high risk of acute deterioration and death. Responsibility should also ensure clear handover of responsibility during transitions of care, as many people with AKI receive no monitoring early after hospital discharge, despite high rates of early recurrence and readmission.

6. **AKI care should be personalised and aligned with management of other acute illness and chronic disease, coordinated by responsible senior decision makers**

   AKI is most often a complication of other acute illnesses, and its occurrence is associated with increased risk of adverse outcomes. It commonly affects people living with multiple long term conditions, who have complex health and social needs. It is thus imperative that measures to mitigate safety risks associated with AKI are coordinated with management of other health conditions.

   Tailored care for these high-risk patients should take into account the relative importance of AKI risk and its impact within an individual patient's set of health concerns. Since AKI often arises as a result of underlying conditions, the risk of AKI will persist unless the root cause is treated. Additionally, safe and comprehensive care should encompass strategies to minimise the destabilisation of chronic conditions like heart failure during and after AKI episodes.

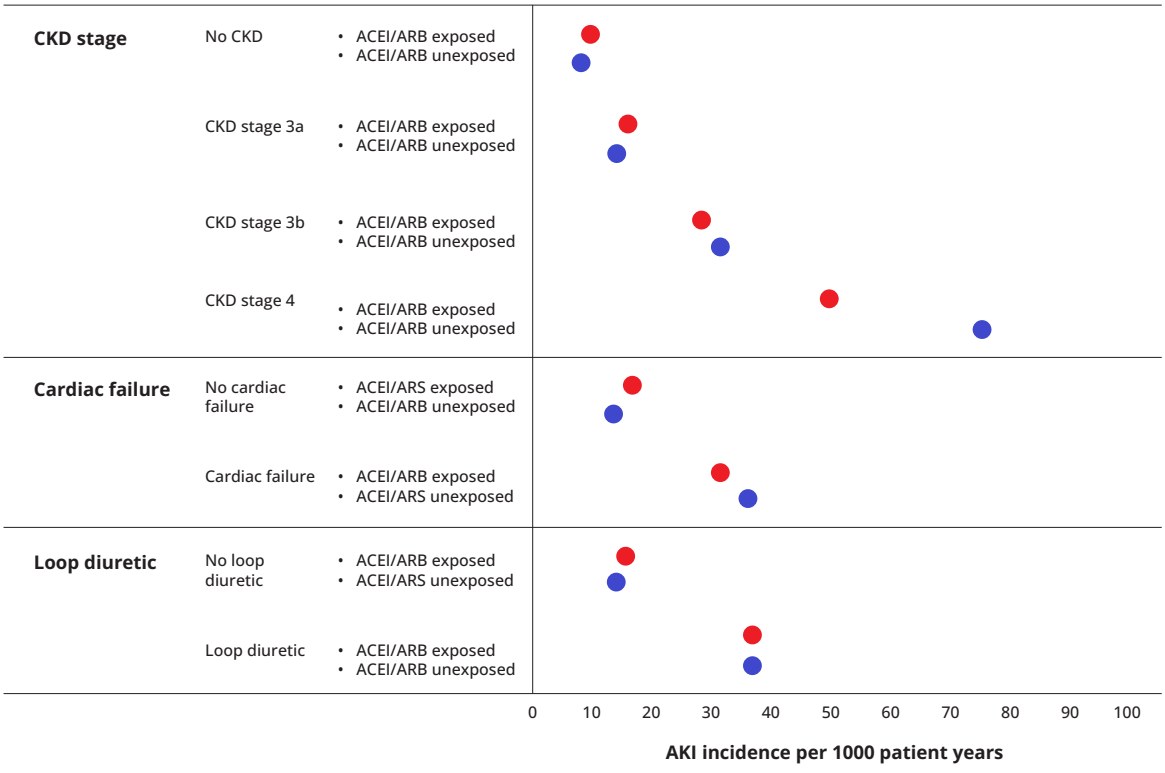
Think Heart: RAAS inhibitor therapy, heart failure & AKI

7. RAAS inhibitor medication (e.g. angiotensin converting enzyme inhibitors, or ACEi) should not be termed "nephrotoxic", as this risks patients and healthcare professionals misunderstanding their overall long-term benefit.

RAAS inhibitors have the highest level of evidence to maintain health and improve prognosis for people living with common and serious long-term health conditions such as heart failure, diabetes mellitus and proteinuric chronic kidney disease (CKD). These same people are at increased risk of developing AKI, especially if they develop acute illness. *However, it is pathology associated with these long-term health conditions that most often underlies their high risk of AKI, rather than RAAS inhibitor therapy.*

Large observational analyses from the UK did not find associations between RAAS inhibitors use and increased AKI risk in these groups at high absolute risk of AKI, when compared to use of other anti-hypertensive medications (Mansfield et al, 2016). Although RAAS inhibitor use across the whole study population was associated with a very small increase in relative AKI risk compared to use of other antihypertensive medication, *this was observed amongst people with lowest absolute risk of AKI and not in patients with heart failure or advanced CKD* (figure 2).

Figure 2: *Modelled rates of AKI per 1000 person-years at risk for AKI during time exposed to antihypertensive treatment including ACEI/ARB compared to time exposed to antihypertensive treatment excluding ACEI/ARB, stratified by characteristics and comorbidities (adapted from Mansfield et al, 2016). Adapted under the terms of the Creative Commons Attribution (CC BY 4.0) license.*



Whilst there are limitations to interpretation of observational data, these findings do not support the convention that RAAS inhibitors are "nephrotoxic" (i.e. commonly and independently cause AKI). This is in contrast to *truly* nephrotoxic drugs (e.g. gentamicin, amphotericin B) which commonly *cause* AKI *regardless of clinical context*, through direct tubular nephrotoxic effects. The association between RAAS inhibitor use and AKI risk instead usually reflects the common use of these drugs in populations who have the highest absolute risk of AKI. *Conventional teaching and practice have incorrectly assumed causality from such association, driving clinical practice for decades despite a lack of rigorous hypothesis testing.*

Continuing to label RAAS inhibitors as nephrotoxic frequently risks these clinically important drugs being stopped unnecessarily or not restarted within a clinically effective time frame, because of professional or public perception that these drugs have caused AKI. There is no evidence to show *routinely* stopping these RAAS inhibitors to prevent AKI is of overall patient benefit (Tomson & Tomlinson, 2019, Ackland et al. 2023) and delays restarting these drugs likely contributes to very high rates of emergency readmission to hospital post AKI (see recommendations 9, 23 and 24).

Overall, continuing to label RAAS inhibitors as nephrotoxic risks affecting patient safety post-AKI, by adversely influencing healthcare professionals and patients' decisions to restart such drugs within a clinically effective time frame. To prevent this, RAAS inhibitors should not be termed nephrotoxic. Undergraduate and postgraduate multi-professional training and clinical practice should reflect and embed this significant change to convention.

8. **Criteria for suspending and restarting RAAS inhibitor medication should be personalised, thoughtfully considered and clearly recorded. Whenever possible, decision-making should be shared with patients and communicated promptly to relevant healthcare professionals, especially during transitions of care.**

Although RAAS inhibitors should not be considered nephrotoxic, a temporary pause in their use may be considered on an individual basis, weighing up risks and benefits. For example, it is often appropriate to pause RAAS inhibitor use in the context of AKI associated with moderate-severe hyperkalaemia (see recommendation 10). Similarly, it may be appropriate to pause RAAS inhibitor and other antihypertensive medications in specific clinical settings where their mode of action may exacerbate an underlying causative process, such as hypovolaemia and / or relative hypotension, including during severe sepsis, where continuing such medication may risk further reducing renal perfusion.

Whilst it may be clinically appropriate to reduce or pause RAAS inhibitors in specific circumstances, *it should be remembered that these medications confer overall substantial longer term benefit for many patients treated with these medications*, such as those with heart failure, diabetes mellitus, or chronic kidney disease. During decision making, clinicians must be mindful of the indication for the use of RAAS inhibitor therapy, as whether to restart may depend on this. The prognostic value of these drugs in heart failure with reduced ejection fraction (HFrEF) is clearly demonstrated, whereas other agents may be viable alternatives if there is no prognostic need for the specific use of RAAS inhibitors. Hypertension is an example.

Similarly, mineralocorticoid receptor antagonists (MRAs), such as finerenone, and sodium-glucose co-transporter 2 (SGLT2) inhibitors are outcome modifying therapies for some patients with heart failure and / or diabetic kidney disease. Decisions around discontinuation and recommencement of these drugs should also be made on a patient by patient basis.

The reason for suspension and criteria for restarting all such outcome modifying medications must be recorded clearly and communicated to the patient and relevant healthcare professionals, especially during transitions of care. Wherever possible, decisions whether or not to restart such medication should be made in partnership with the patient.

Consider using *Think Kidneys*, Renal Pharmacy Group AKI Leaflet and RCGP resources including Royal College of General Practitioners (RCGP) AKI Toolkit and RCGP Top Ten Tips for Post-discharge Care to support decision-making (also see recommendation 20).

9. Early reinitiation of RAAS inhibitor therapy after AKI may confer benefit, especially for people with heart failure with reduced ejection fraction, where discharge from hospital without RAAS inhibitors carries higher risk for mortality and readmission.

Large observational data shows AKI in hospital is an independent risk factor for death or early emergency readmission, commonly due to pulmonary oedema (Sawhney et al, 2017). Whilst there are caveats to interpretation of such observational data, it suggests many patients are readmitted to hospital due to decompensated heart failure. Not having RAAS inhibitors and / or diuretics restarted after discharge is associated with increased risk of death without reduced risk of AKI. Therefore, if such medication is paused during AKI, re-initiation after AKI recovery must be considered a priority. Early clinical assessment to guide treatment is essential; early follow-up with the heart failure team should be planned prior to discharge for patients with heart failure.

A specific focus on heart failure is justified, as heart failure is the most common cause of hospitalisation in older people, and is a comorbid finding in up to 14% of hospital in-patients. Furthermore, patients with heart failure with reduced ejection fraction (HFrEF) are at very high risk of both AKI and decompensated heart failure, and death occurs in 32% of heart failure hospitalisations complicated by AKI. Discharge without RAASi therapy is associated with higher rates of readmission and death. Optimal care therefore involves a balance of risks. These patients require timely and regular assessment by a senior decision-maker, and urgent referral to the heart failure team for review, to establish RAAS inhibitor and other treatment priorities (such as diuretic strategy), and an escalation plan. In the context of decompensated heart failure, it may also be preferable to down-titrate rather than suspend RAAS inhibitor therapy if the latter is being considered. Exceptions are severe hyperkalaemia (recommendation 10), or symptomatic hypotension as per figure 3 .

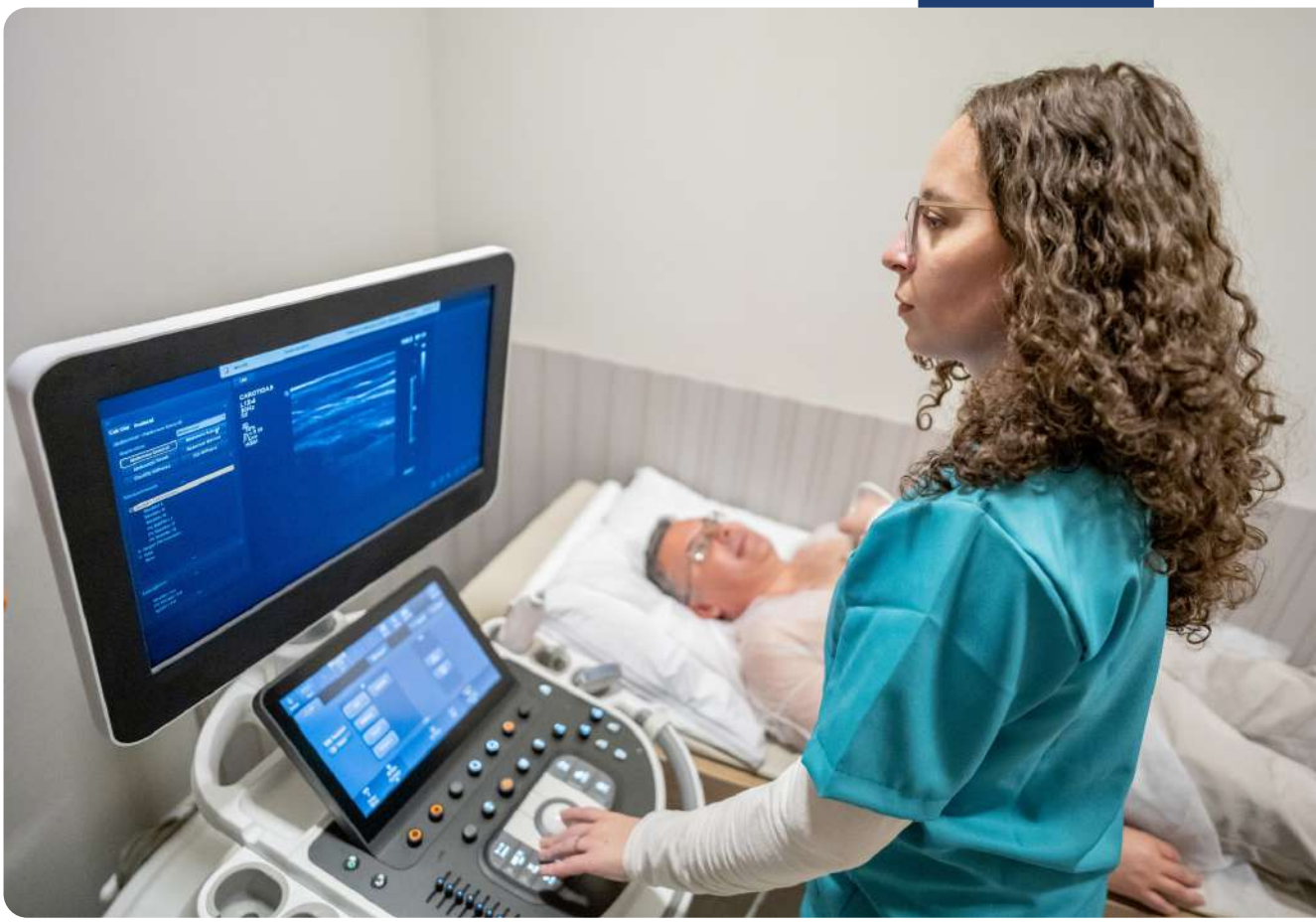
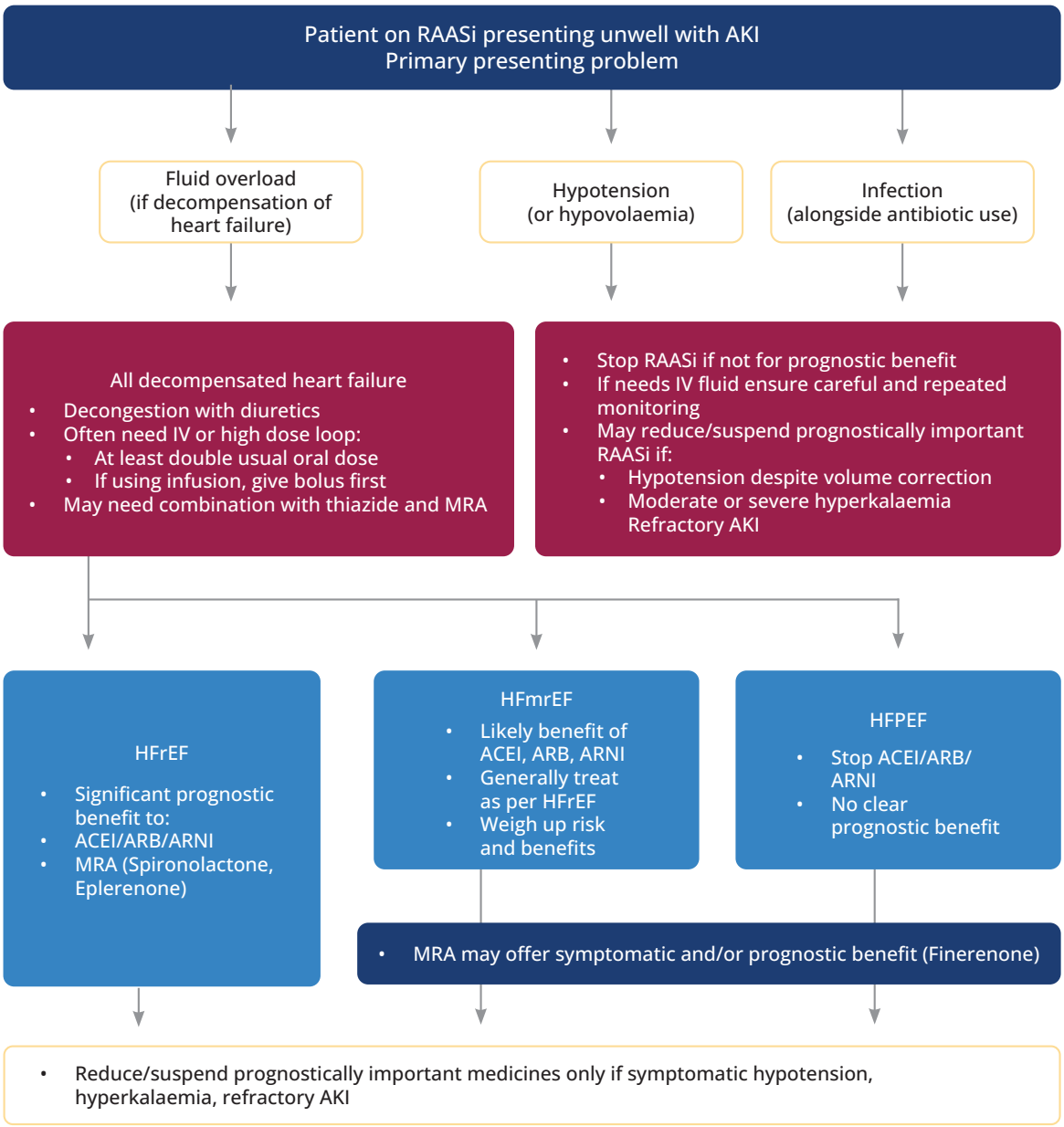


Figure 3: *Management of patients with AKI or worsening renal function who are receiving RAAS inhibitor (adapted from Clark et al. 2019) Adapted under the terms of the Creative Commons Attribution (CC BY 4.0) license.*



RAASi = renin-angiotensin-aldosterone-system inhibitors, IV = intravenous, ACEi = angiotensin converting enzyme inhibitors, ARB = angiotensin receptor blockers, MRA = mineralocorticoid receptor antagonist, ARNI = angiotensin receptor / neprilysin inhibitor, HFrEF = heart failure with reduced ejection fraction, HFmrEF = heart failure with mildly reduced ejection fraction, HFpEF = heart failure with preserved ejection fraction.

Since the above review was published (*Clark et al. 2019*), new evidence shows that there is no evidence to support stopping RAASi in patients with progressive CKD (Bhandari et al., 2022), underlining decisions for this indication should similarly be individualised and tailored to clinical context.

10. **Hyperkalaemia is a medical emergency, requiring prompt action supported by readily accessible up-to-date local guidelines. If RAAS inhibitors are suspended these should be restarted, once hyperkalaemia is under control and clinically appropriate. Potassium binders may allow RAAS inhibitors to be continued in moderate hyperkalaemia with no ECG changes.**

    Moderate (6.0-6.4mmol/L) or severe (≥6.5mmol/L) hyperkalaemia is a medical emergency. This necessitates that local hyperkalaemia guidelines are up-to-date, easily available, and promptly implemented. We recommend ensuring local guidelines are broadly consistent with those produced by the UK Kidney Association (2023).

    Potassium binders are now readily available and may allow RAAS inhibitors to be continued in moderate hyperkalemia with no ECG changes. These are found in the NICE technology appraisals for sodium zirconium cyclosilicate and patiromer.

    There is a risk of underdosing with calcium gluconate in severe hyperkalaemia. Hospitals must ensure the correct dose of calcium in local guidelines. Further guidance is found in the related National Patient Safety Alert (2020).

    Additional considerations for patients with hyperkalaemia treated with RAAS inhibitors in the context of HFrEF, are listed in table 1. Whilst there are components of the hyperkalaemia care pathway that may differ slightly between this recommendation and those referenced, this represents the nuances of broad guidelines where multiple specific clinical presentations are being considered, and not disagreement between documents. In practice, clinical judgement must prevail.

Table 1: *Considerations when managing a patient with heart failure who develops hyperkalaemia (adapted from Clark et al. 2019) Adapted under the terms of the Creative Commons Attribution (CC BY 4.0) license.*

Table 1 Considerations when managing a patient with heart failure who develops hyperkalaemia			
Serum K^+>5.4	All patients		
Check for overdiuresis/hypovolaemia. Non-selective beta-blockers can increase potassium. Review indication (prognostic benefit in HFrEF but not HFpEF) - try to continue in HFrEF. Stop K supplements. Stop amiloride and triamterene. Stop non-steroidal anti-inflammatory drugs. Stop trimethoprim. Stop sodium substitutes. Check for digoxin toxicity. Provide low K diet advice.			
Serum K^+	Mild hyperkalaemia 5.5-5.9mmol/L	Moderate hyperkalaemia 6.0- 6.4 mmol/L	Severe hyperkalaemia >6.5 mmol/L
Patient clinically well, no AKI	Increase frequency of biochemical monitoring but do not stop RAAS inhibitors, Consider reducing dose.	Stop RAAS inhibitor(s), repeat test Re-start at lower dose once K<5.5 Re-start one drug at a time, with biochemical monitoring, if the patient was previously on a combination of ACEI/ARB/ ARNI plus MRA	*Admit to hospital for immediate K-lowering treatment.* Repeat blood test 24 hours later. Restart at lower dose once K^+ <5.5 Restart one drug at a time, with biochemical monitoring, if the patient was previously on a combination of ACEI/ARB/ ARNI plus MRA
Patient clinically unwell with sepsis or hypovolaemia and/ or AKI.	Withhold RAAS inhibitors until sepsis/ hypovolaemia corrected, then restart.	Withhold RAAS inhibitor(s) until sepsis/ hypovolaemia corrected, then restart once K^+<5.5.	Withhold RAAS inhibitor(s) until sepsis/hypovolaemia corrected, then restart once K^+ <5.5. Restart one drug at a time, with biochemical monitoring, if the patient was previously on a combination of ACEI/ ARB/ARNI plus MRA
Patient clinically unwell with decompensated heart failure with/without AKI	Do not withhold RAAS inhibitors. Consider reduce dose. Treat congestion with loop diuretics or combination of loop and thiazide diuretics	Reduce dose of RAAS inhibitor(s) and monitor frequently. Treat congestion with loop diuretics or combination of loop and thiazide diuretics.	Withhold RAAS inhibitor(s) and restart at lower dose when serum K^+ <6.0 Restart one drug at a time, with biochemical monitoring, if the patient was previously on a combination of ACEI/ARB/ ARNI plus MRA
ACEI, ACE inhibitor; AKI, acute kidney injury; ARB, angiotensin receptor blocker, ARNI angiotensin receptor-neprilysin inhibitor; RAAS, renin-angiotensin-aldosterone: MRA, mineralocorticoid receptor antagonist.			

Patient care & safety: fluid & medicines

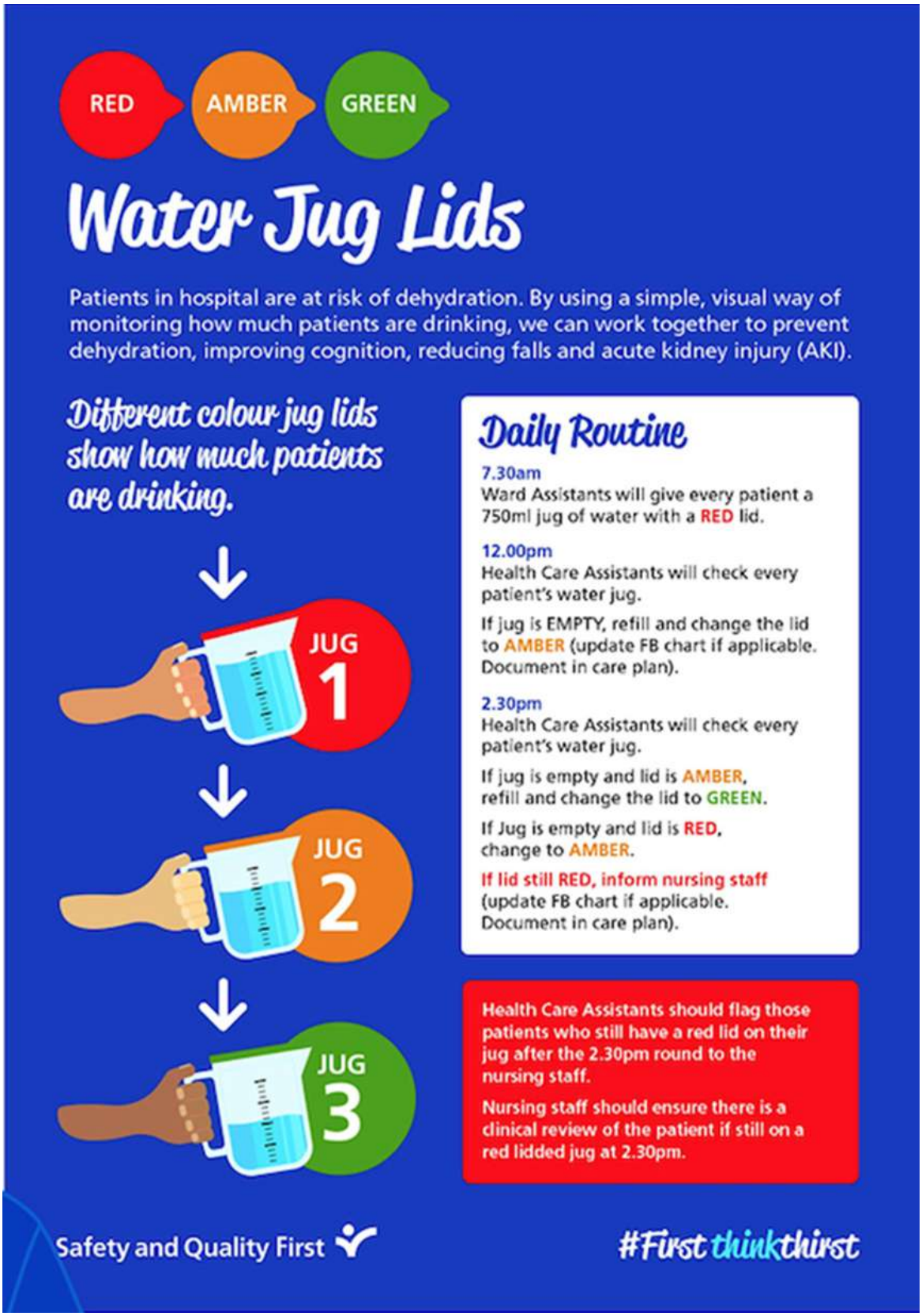
11. **Multidisciplinary teams should proactively identify people at risk of dehydration and implement interventions, in partnership with their family and carers, to ensure that they maintain adequate intake of oral fluids, to reduce their risk of AKI.**

    Many patients at *risk* of AKI are also at *risk* of dehydration, especially when they develop common acute illnesses, associated with sepsis, delirium, or diarrhoea and vomiting. This is especially true for many patients with complex health and social needs, including those with cognitive impairment or poor mobility, particularly if they are hospitalised or otherwise displaced from their usual care setting. For older patients the ESPEN (2022) ESPEN practical guideline: Clinical nutrition and hydration in geriatrics recommendations (section 3.3) ESPEN practical guideline: Clinical nutrition and hydration in geriatrics should be utilised to assist in recognising, responding and monitoring hydration status across all healthcare settings.

    Healthcare professionals, carers and (where possible) patients should be aware of the need to maintain adequate intake of oral fluids, especially when they are unwell, to reduce their risk of dehydration and AKI associated with this. Simple and cost-effective measures that are easy to implement, can help reduce risk of low-intake dehydration when such patients are hospitalised or managed in other care settings, as exemplified in figure 4 and presented by Allinson and colleagues (Allinson et al., abstract 296, UK Kidney Week, 2020) here.

    Ensuring adequate oral intake of fluid is often all that is required to reduce risk of low-intake dehydration in such circumstances. *Intravenous fluids should only be considered for patients who are unable to maintain adequate oral intake of fluid, or those who have already developed dehydration, hypovolaemia, or relative hypotension (blood pressure below their usual baseline blood pressure*), as per recommendation 12.

Figure 4: *Example strategy to support adequate fluid intake for patients at risk of dehydration in care settings during episodes of acute illness, developed by South Tees NHS Foundation Trust, used with permission.*



12. **Intravenous fluids (IVF) should not be a default treatment for all patients with AKI. Prescription of IVF should be guided by clinical examination, with regular review and recognition of when to de-escalate / stop, as per NICE guidance for intravenous fluid therapy in adults in hospital.**

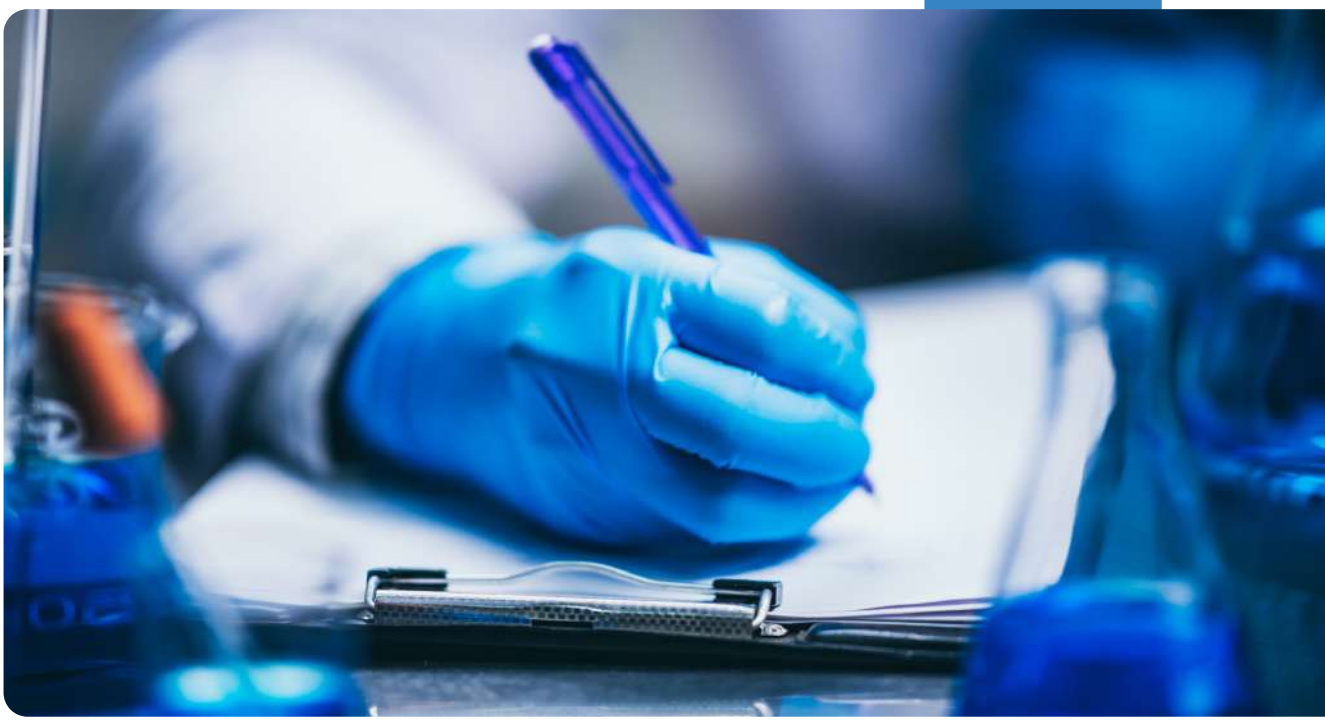
    Whilst rehydration should be considered for patients with dehydration or hypovolaemia, intravenous (IV) fluids should *not be a default treatment* for all patients with AKI. *Inappropriate IV fluids risk acute deterioration and patient safety, due to fluid overload and pulmonary oedema*. IV fluid should therefore not be routinely given to patients who are not dehydrated, hypovolaemic, or have relative hypotension (blood pressure below their usual baseline blood pressure). *This is especially true for patients with heart failure, who are at high risk of pulmonary oedema if given inappropriate IV fluid.*

    When IV fluid therapy is used, regular clinical assessment and fluid balance review must be undertaken to monitor response, guide further therapy and mitigate patient harm associated with inappropriate fluid therapy. Prescription of IVF should thus be guided by clinical examination, with regular review and recognition of when to de-escalate / stop, as per NICE guidance - Intravenous fluid therapy in adults in hospital.

    It is imperative that healthcare staff responsible for patients with or at risk of AKI, are competent in fluid balance assessment and management. Generalist healthcare professional training and continuing professional development should reflect this. Senior clinician opinion should be secured where necessary, including to ensure fluid safety for multi-morbid patients with heart failure, or otherwise complex fluid balance scenarios. In addition, early referral to relevant expert teams such as heart failure specialist services is necessary.

13. **Diuretic therapy is not contraindicated in AKI associated with fluid overload. It may improve renal function if AKI is driven by renal congestion, as can occur in heart failure.**

    Fluid overload is a common driver of AKI in heart failure and therefore the management for many of these patients is decongestion with more diuretics, not dose reduction or suspension. Renal hypoperfusion associated with AKI with heart failure, for example, will be more typically driven by high venous pressures as opposed to low mean arterial pressure.



14. **All medications should be reviewed in patients with AKI and, if necessary, dose adjusted or suspended to mitigate medication-related patient safety risks. As AKI resolves it is important to review medications again with a plan to restart medications or readjust doses where appropriate.**

    In patients with AKI, all medications should be reviewed and, if necessary, dose adjusted or suspended, to mitigate medication-related patient safety risks. Consult the British National Formulary, the Renal Drug Database (login required), Medicines Complete (login and subscription required), Think Kidneys Medication resources and Renal Pharmacy Group UK RPG AKI Leaflet 2022 (ukkidney.org) for specific support and advice. for specific support and advice. Involvement of a specialist renal pharmacist may be beneficial.

    Many medications can accumulate due to reduced renal medication clearance during AKI, causing medication toxicity that can lead to serious patient harm. Common examples include insulin, opiates, gabapentin, metformin, digoxin and some antibiotics.

    Few medications are truly "nephrotoxic" (i.e., *commonly cause* AKI in people who are otherwise well); examples include NSAIDs, gentamicin and amphotericin B, which typically should be avoided in patients with AKI after an evaluation of risks versus clinical benefit. Where high risk prescribing is indicated, it should be accompanied by enhanced monitoring of kidney function.

    Antihypertensive medications, including diuretics, may risk worsening AKI severity or duration by reducing renal perfusion *if used in specific clinical circumstances*, such as hypovolaemia, relative hypotension, or severe sepsis. In the setting of hypotension / hypovolaemia / sepsis, all antihypertensive medication (*not just* RAAS inhibitors) should be reduced or suspended, although beta-blockers should not be stopped abruptly in patients with a history of ischaemic heart disease, atrial fibrillation or heart failure. Diuretics will be required in the setting of volume overload, but adjustments should be made cautiously to avoid exacerbating volume depletion and renal hypoperfusion. This generally requires regular clinical review and careful fluid assessment. (Recommendations 12 and 13). Medication reviews should be repeated in the course of AKI, because some medications, such as antibiotics, may require dose increases once a patient recovers renal function.

    If drugs are adjusted or suspended at the time of AKI, it is important that criteria for restarting such medications are documented and communicated clearly to patients and onward healthcare professionals, especially during transitions of care. Providing such advice to patients aligns with the NICE Quality Standard for AKI (NICE QS76: Statement 1, 2023 update) and is imperative for drugs with clear prognostic benefit, such as RAAS inhibitor therapy for patients with heart failure (HFrEF but not HFpEF). Local heart failure teams should be contacted for expert guidance.

15. **While sick-day advice is commonly used to try to mitigate AKI during acute illness episodes, there is no evidence that this is beneficial for RAAS inhibitors and MRAs and it may risk overall harm if applied inappropriately.**

    Sick day medication guidance typically includes recommendations to withhold specific medications for the duration of an acute illness and when symptoms lead to reduced oral intake, such as fevers, sweats, vomiting and diarrhoea unless minor (Think Kidneys, 2020).

    There is no robust evidence to support widespread, routine implementation of generic sick day advice to prevent AKI (Fink et *al, 2022*). Concerns have also been raised that harm may occur if sick day protocols are misinterpreted or miscommunicated and lead to inappropriate pauses in medication (Doerfler *et al*., 2019). Whilst personalised sick day advice may be beneficial in some circumstances for some patients (Watson *et al*., 2023), this must be clearly communicated and tailored to well defined, specific clinical circumstances (Martindale, 2017).

    If sick day advice is given in secondary care this advice should also be shared with patients' primary care teams to ensure continuity. Clear advice must be given also on when to restart medication as potential harm may occur if not restarted.

    Note that this recommendation applies to AKI prevention only, and does not apply to sick day advice commonly used for other reasons in other health settings, such as insulin or steroid dose adjustments.

16. **Decision-making regarding use of iodinated contrast media (iodinated CM) in patients at risk of AKI should be led by the clinical team responsible for their care. It should be personalised and shared with patients, when clinically appropriate. Renal referral to discuss routine use of Iodinated CM is not usually necessary.**

    Iodinated CM is often used for clinically important tests or treatments, to help treat severe acute illness and / or life-threatening disease. It is thus imperative that decisions regarding iodinated CM use are tailored to clinical context and personalised, led by senior clinicians who understand the indication and timeliness for such tests or treatments for a particular patient. Senior decision-makers responsible for the care of patients should therefore lead decision-making about iodinated CM use. It is likely that a nephrology referral will not be necessary in most circumstances. Decision-making should be discussed and shared with patients and their carers, whenever this is possible.

17. Decision-makers should aim to minimise delays in iodinated CM use that are likely to be clinically significant, recognising a causal role for iodinated CM in the development of AKI is frequently overestimated.

Iodinated CM are often used to investigate or treat clinical problems that frequently cause AKI, such as cardiac or haemodynamic instability, complex sepsis, hypovolaemia, gastrointestinal blood loss, cancer or other serious systemic disease. When these underlying clinical problems cause AKI in such circumstances, the association with iodinated CM use is non-causal. Accordingly, iodinated CM use is usually a marker of AKI risk, rather than a cause or mediator of AKI and the term 'contrast-induced kidney injury' has been replaced with the term 'contrast-associated acute kidney injury' as part of the 2024 update to NICE guidance (NICE Guideline [NG148] 2024 update information).

Recent systematic review and meta-analysis of studies specifically designed to investigate a causal association between iodinated CM use and AKI, suggests a causal role for iodinated CM in the development of AKI, is frequently overestimated (Obed et al., 2022). Use of modern (low or iso-osmolar) iodinated CM agents is a rarer cause of AKI, though this is more likely with intra-arterial iodinated CM administration or in patients with advanced CKD (eGFR < 30ml/min/m^2) or established AKI at the time of iodinated CM use.

Decision-makers should follow the updated NICE guidance to support decision-making about iodinated CM use (NICE Guideline [NG148] 2024 update: recommendations 1.1.5 to 1.1.12 and visual summary). They should consider that delayed contrast-use or avoidance may risk poorer overall patient outcomes, especially if clinically significant benefits of the iodinated CM-based test or treatment are time-sensitive. This is especially important for iodinated CM use in emergency situations, which should not be delayed due to concerns about AKI (Joint Advisory Statement between Royal College of Radiologists & Royal College Emergency Medicine, 2023 and NICE Guideline [NG148] 2024 update, recommendation 1.1.7).

Decision-makers should consider general measures to reduce AKI risk at the time of iodinated CM use and monitor kidney function if clinical context indicates high-risk of AKI. For example sepsis should be treated if present and fluid resuscitation considered in the context of dehydration (see recommendation 11), though such interventions should not delay iodinated CM use in clinically urgent situations. Large-scale meta-analysis (Walker et al., 2022) does not support the use of specific therapies conventionally thought to reduce risk of AKI at the time of iodinated CM use, such as n-acetylcysteine and sodium bicarbonate.

AKI in hospital: organisation of care

18. NHS Hospital services and care should be organised and audited to limit avoidable adverse patient outcomes and service use associated with AKI. These include high mortality, length of stay, critical care use, and emergency readmission.

Hospitals should ensure AKI services enable hospital-wide AKI awareness and capability, to mitigate adverse outcomes and service-use associated with AKI, mindful that renal services typically only primarily manage 7% of all AKI cases. Organisation of care should include regional renal referral, in-reach service and patient transfer pathways (as per recommendations 20 and 21), to ensure equity of access to renal services for patients requiring dialysis for severe AKI, or specialist therapies for AKI caused by intrinsic renal diseases.

There is system-wide variation in the organisation of AKI care, and this very likely contributes to the extent to which those at risk of developing AKI are identified and receive timely care. For example, GIRFT renal data found only 87% of hospitals with on-site renal services had a written AKI protocol (Lipkin & McKane, 2021). A national survey of acute hospitals conducted in 2022 found reported prevalence of AKI multi-professional teams was similar in hospitals with (43%) and without (40%) on-site renal services (RSTP and UKKA, 2022).

Prevalence of AKI clinics amongst hospitals responding to the survey was also similar for hospitals with (26%) and without (28%) on-site renal services. The definition, governance and location of such AKI clinics likely varies across hospitals, including provision within Same Day Emergency Care (SDEC) clinics and clinics specifically developed and commissioned to provide AKI care. Of note, only 56% of hospitals without on-site renal services reported regular visiting renal in-reach services and only 40% reported having written inter-hospital AKI patient-transfer criteria.

Both inpatient and post discharge AKI care should be defined by each hospital with appropriate governance structures / strategies in place to ensure high quality patient centred care. Hospitals should have a method of monitoring and reporting AKI outcome data locally (e.g. deteriorating patient workstreams). Acute hospitals should work collaboratively with Specialised Services Kidney Networks across the country, to ensure standardised and timely access to local Renal Services for patients with AKI who require specialist treatments such as dialysis, supporting delivery of care set out within the NHSE Renal Service Transformation Programme Toolkit (2023) and Service Specification for AKI.

The RSTP AKI self-assessment questionnaire for services can be used for service configuration and mapping.

19. **Acute NHS Hospitals should consider establishing multi-professional AKI teams to support and maintain timely and effective hospital-wide AKI care**

The impact of AKI allied healthcare professional teams on AKI patient and organisational outcomes is not fully understood, however, single centre evaluations have illustrated potential benefits of AKI teams at a local level. This includes improvements in care process compliance, reducing length of hospital stay (Bickerton et al.,2022 and Allinson et al., 2018) and reducing readmission rates (Bonfield, 2021).

Approximately 40% of Acute NHS Hospitals that responded to a national AKI Services survey reported utilising multi-professional AKI teams to support timely and effective AKI care, hospital-wide (NHS England & NHS Improvement, 2022). The composition, scale and remit of such multi-professional AKI teams varies, but typically includes support and delivery of hospital-wide inpatient and post-discharge AKI care, quality improvement, audit, awareness raising, education and training (Torr et al., 2023).

An AKI allied health professional service could involve proactive and timely review of patients with AKI stage 2 and 3 for both inpatient and post hospital care. This could be supported by appropriate members of the MDT (e.g. nephrologists, critical care teams, acute medical teams and clinical pharmacists). Staff in these posts should receive appropriate training, and support to deliver high quality care against local service specifications. This should include cross-specialty engagement for pivotal comorbid factors such as heart failure. The acceptability to users and outcomes of patients entering newly implemented services should be evaluated.

Standardising safe and timely interhospital patient transfer

20. Local guidelines for renal referral and standards for safe and timely interhospital patient transfer should be agreed and implemented.

Referral criteria and standards for safe and timely inter-hospital transfer of patients from a hospital without on-site renal services to a renal ward in a hospital with on-site renal services, must be clear and documented. Effective referral and transfer processes that prioritise people with greatest renal service need will help ensure they receive timely specialist treatment, and is consistent with the NICE AKI Quality Standard (NICE QS 76: Quality Statement 5); potential benefits include reduced mortality (Peracha et al, 2022), shorter overall hospital stay, and improved long-term outcomes.

Regional criteria and process for patient referral will reflect local service provision, though should be consistent with those recommended within NICE AKI Guidelines (NG 148, 2019: Recommendations 1.5.6 to 1.5.17) and ensure equitable access to renal specialist services.

Regional standards for safe and timely inter-hospital transfer will similarly reflect local service provision, though should be based upon the National Early Warning Score (NEWS) 2. Example safety thresholds for inter-hospital patient transfer to renal wards from general wards are shown in figure 5. Such thresholds should support safe and consistent decision-making; however, *it is imperative that overall clinical judgement prevails between responsible senior clinical decision-makers*, especially for patients with pre-morbid baseline physiological parameters that usually sit outside of such thresholds.

Figure 5: *Example of criteria for safe inter-hospital transfer to a renal ward, draft version for North Yorkshire and Humber Renal Network, used with permission. Hospitals should agree upon, document, and adhere to local criteria in collaboration with their local renal service.*

Criteria for transfer of patients to Renal Unit

Transfer can only be considered following agreement between consultants on call at each site.
The nursing staff at the referring hospital **must also liaise with** the renal nursing staff to confirm the patient has been accepted for transfer.
Transfer target <24 hours with ICU step down patients arriving before 5pm and non-ICU transfers arriving before 7pm.
Late transfers can only be considered if renal specific treatment is required out of hours.

It is the responsibility of the referring team to ensure that the patient remains stable right up to the point of transfer, with clinical review. Patients must be fit for level 1 care.

Circulatory Status
HR greater than 50 and less than 120 bpm
BP *greater than* 100 mmHg systolic
MAP greater than 65 mmHg
Lower BP values may be accepted if it has been firmly established that these are pre-morbid
Lactate less than 3mmol/L

Respiratory Status
Respiratory rate *greater than* 11 and less than 25/min
Oxygen saturation *greater than* 94% (unless target saturation 88-92%) on low flow oxygen
If patient has required acute CPAP, to have been independent of this for 24 hours

Neurological Status
Alert on ACVPU score or Glasgow Coma Scale *greater* than 12

National Early Warning Score
NEWS *less than* 5 and no individual parameter scoring *greater than* 3

Potassium Status*
Potassium *less* than 6.0mmol/L and no hyperkalaemic ECG changes
If hyperkalaemia has been treated it must be determined how and when (in case of rebound)

**Special consideration will need to be taken when organising transfer of chronic haemodialysis patients*

Acid-base Status*
pH *greater than* 7.2
Venous bicarbonate *greater than* 12mmol/L
**Special consideration will need to be taken when organising transfer of chronic haemodialysis patients*

If criteria not met, initiate emergency referral to local critical care outreach / ICU team

21. Clinically approved patient transfer to a renal centre should occur within 24 hours of approval by the receiving renal consultant. Compliance should be audited. Safe repatriation of patients following recovery from AKI should be timely and planned.

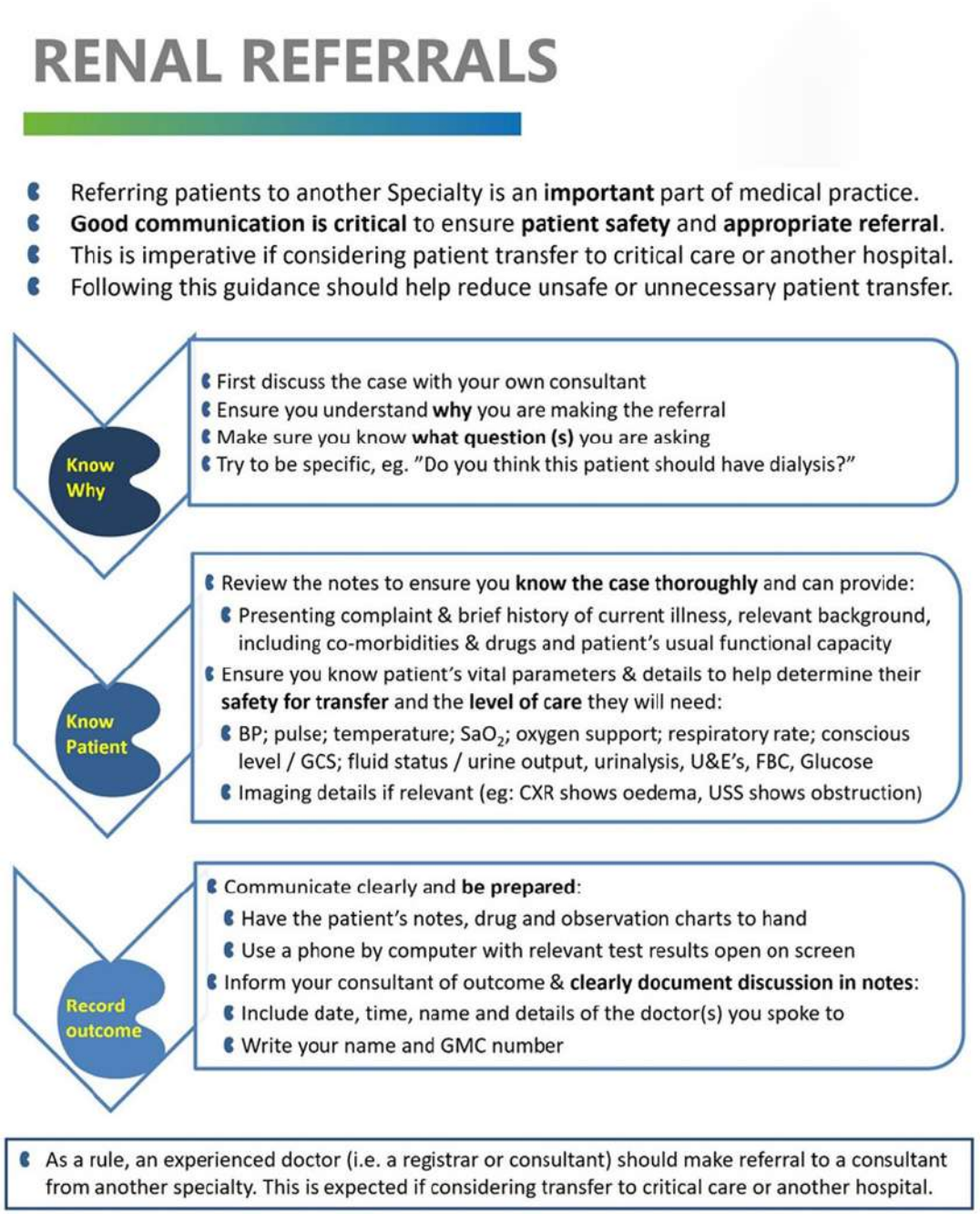
Consider urgent transfer of patients to a hospital with on-site renal services if they develop advanced AKI or their AKI is caused by intrinsic renal disease. The Renal GIRFT report found significant delays in the transfer of such patients with advanced AKI, from referring hospitals to renal centres (Lipkin & McKane, 2021).

Almost three quarters of renal centres reported delays in transfer of more than 24 hours and all these centres reported adverse patient outcomes because of the delay (eg. Bickerton et al. 2023). Adverse outcomes included patient deterioration and unnecessary use of critical care services, solely to enable continuous kidney replacement therapy. Factors reported to contribute to inappropriate delay in patient transfers included lack of bed access in trusts with renal centres and lack of an agreed inter-hospital transfer standard (only 58% of renal centres reported they had a written transfer protocol). Difficulties securing timely transport can also preclude patient transfers within a desired time frame. Delays have also been attributed to infection prevention issues, such as having to wait for CPE or MRSA status.

Whilst inter-hospital transfers should occur within 24 hours when this is clinically appropriate and approved, it should be noted that this will not be clinically appropriate for all with patients with advanced AKI, including those not clinically fit for inter-hospital transfer (see recommendation 20) when escalation to critical care should be considered, or those who require end-of-life care at their local hospital.

Timely referral to the on-call nephrology team should be completed by an informed senior decision-maker (e.g. consultant, senior trainee, or experienced nurse) responsible for the patient. The referral process should be configured to local service infrastructure and include essential clinical information, such as exemplified in figure 6.

Figure 6: *Example of recommended process and required details when referring patients with Acute Kidney Injury (AKI) for renal consultation or transfer, developed by South Tees Hospitals and County Durham and Darlington NHS Foundation Trusts, used with permission. Hospitals should agree upon, document, and adhere to local criteria in collaboration with their local renal service.*



When urgent patient transfer is clinically approved, *regional renal networks should monitor delayed transfer by means of exception reporting* by the referring or receiving centre as per RSTP toolkit.

Ensuring safe and timely post-discharge care

22. Senior decision-makers responsible for the care of patients hospitalised with AKI should agree who is responsible for their care post-discharge, and share this with patients and their carers.

AKI is an independent risk factor for death or emergency readmission, the latter often occurring within 30 days of hospital discharge (Silver et al, 2017, Sawhney et al, 2017). This underlines that hospitalised patients with AKI remain a high-risk population at and after the point of discharge, even if they have recovered from the acute illness or surgery at the time of their admission.

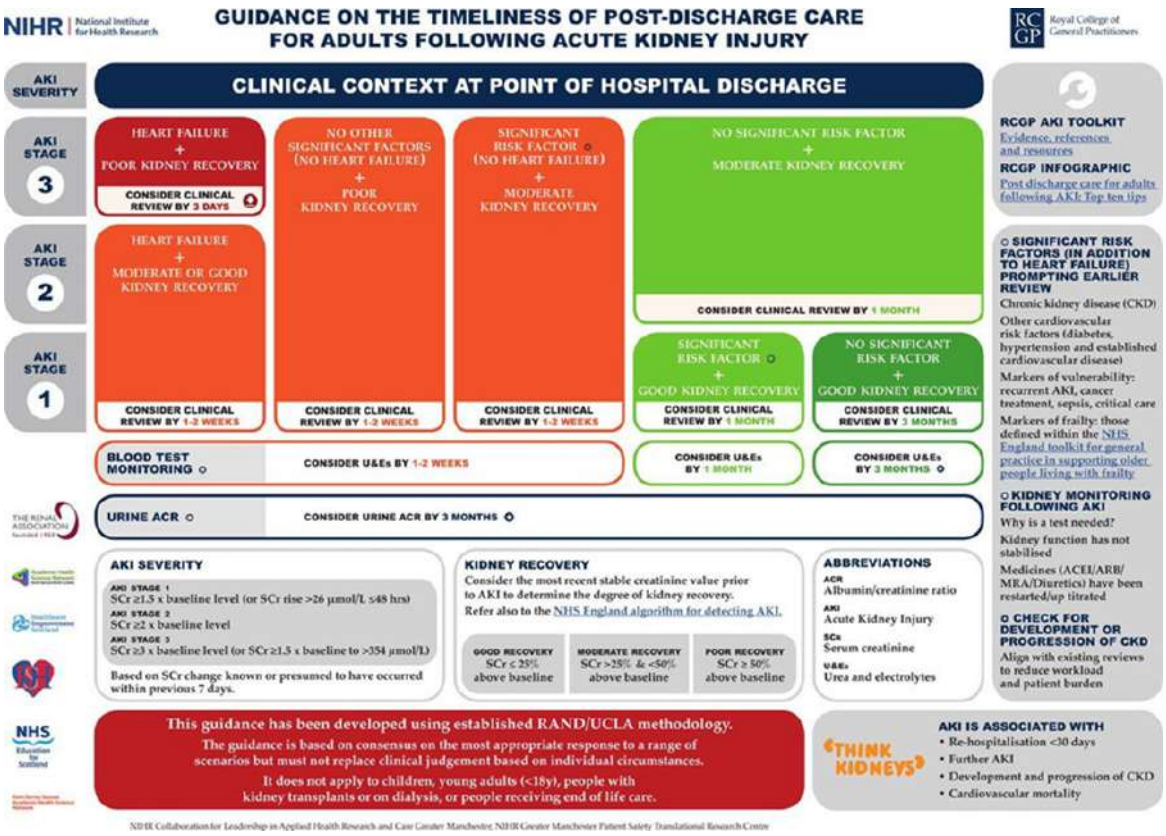
Despite these high early risks among AKI survivors, patients frequently receive no early monitoring after discharge (Sawhney et al, 2021). Ensuring clinical responsibility for timely post-discharge care is imperative to prevent adverse patient outcomes and use of unscheduled care services, including emergency hospital readmission when this may be avoidable (eg, decompensation of heart failure following cessation of heart failure medications) or inappropriate (eg, where AKI has occurred in context of terminal illness).

23. Decision-making regarding timeliness, setting and composition of post-discharge care should be holistic and personalised, aiming to stabilise long-term health conditions and minimise adverse outcomes, such as unplanned readmission.

Large observational data show early emergency readmission to hospital post-discharge is commonly due to pulmonary oedema (Sawhney et al, 2017). Whilst there are caveats to interpretation of such observational data, it suggests many patients are readmitted to hospital due to decompensated heart failure. Furthermore, many of these early adverse outcomes might be prevented if medicines stopped at the time of AKI are restarted within a clinically effective time frame (see recommendation 9). Post-discharge care for these high-risk patients should thus be coordinated and include timely and holistic clinical review, incorporating medicines reconciliation and advanced care-planning, as outlined in the Royal College of General Practitioners (RCGP) AKI Toolkit and RCGP Top Ten Tips for Post-discharge Care (2018).

Adults discharged from hospital after AKI should have a clinical review within 3 months, or sooner if they are considered at higher risk of poor outcomes (NICE QS 76: Quality Statement 6, 2023). Clinical judgement regarding composition, setting and timeliness of post-discharge care should be personalised and clearly communicated, with earliest follow-up arranged for patients considered highest risk, such as those with heart failure and / or poor recovery of kidney function at the point of discharge, as outlined in figure 7.

Figure 7: *An appropriateness ratings evaluation to guide post-discharge care following acute kidney injury (Tsang et al, 2020). The strongest factors prompting earlier clinical review were the presence of heart failure and poor kidney recovery. Reused under the terms of the Creative Commons Attribution (CC BY 4.0) license.*

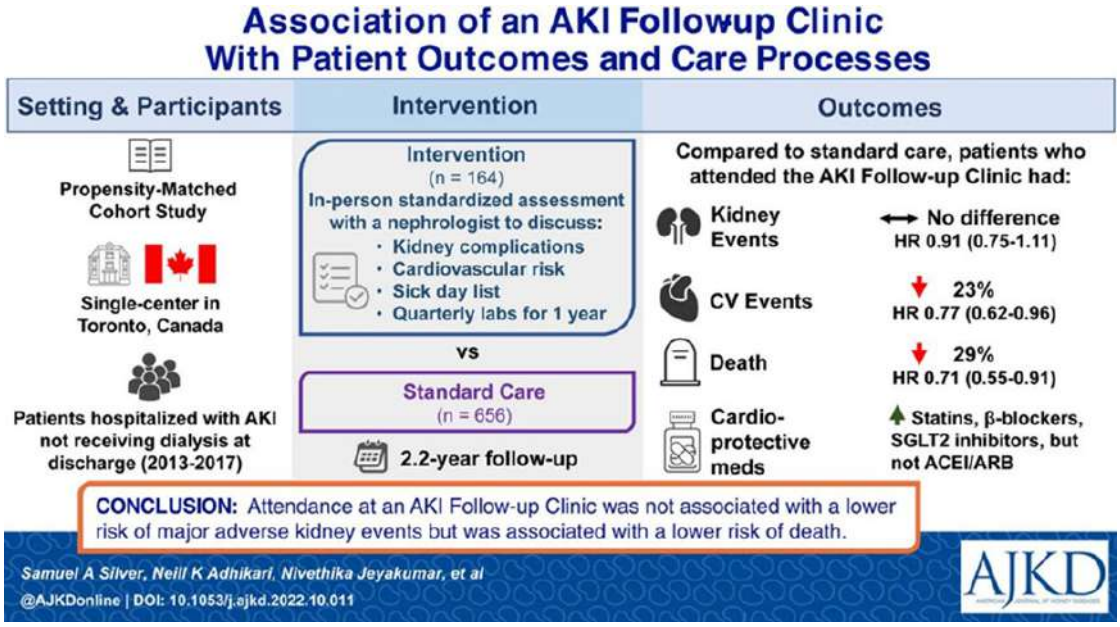


Acute hospitals should work with their local providers to establish mechanisms to deliver this care, tailored to clinical context and risk, alongside local service provision. For example, some patients hospitalised with AKI may receive post-discharge care within secondary care clinics linked to the underlying cause of their AKI (e.g. cardiology, oncology, older people's medicine), or as part of long-term condition reviews within Primary Care services.

Timely follow up for highest risk discharges should be agreed at the earliest opportunity, and not presumed. This is particularly important for people living with heart failure, who should be referred to the heart failure team prior to discharge to secure timely clinical review and medicines reconciliation post AKI, ideally within two weeks. Whilst such specialist hospital clinics may provide timely and appropriately tailored reviews for some highest risk patients (eg, heart failure clinics for those with severe heart failure, or renal clinics for those likely to need early dialysis), it is unlikely these specialty clinics can accommodate all high-risk discharges post AKI.

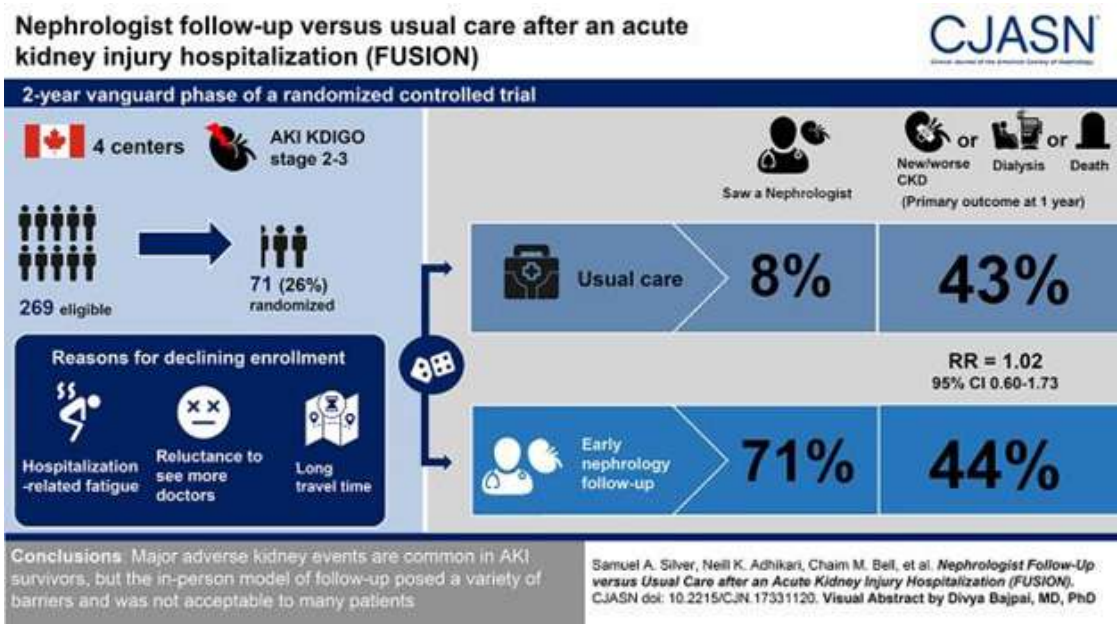
Some acute NHS hospitals have developed multi-professional AKI clinics to ensure timely and effective post-discharge care for high-risk discharges. The setting and composition of current AKI clinics is varied, as are criteria defining which patients attend and for how long (see recommendation 18). Thus, current data supporting patient and healthcare service value of such clinics is limited to subsets of patients, single centre studies, and audits. For example, Silver and colleagues (2023) report that follow-up in a Canadian AKI clinic was associated with a lower risk of death and increased prescriptions for some cardio-protective medications (Figure 8).

Figure 8: *Patient outcome and care processes associated with an AKI clinic in Canada. Reprinted from American Journal of Kidney Diseases, Vol. 81, Issue 5, Silver SA, Adhikari NK, Jeyakumar N, et al., Association of an Acute Kidney Injury Follow-up Clinic With Patient Outcomes and Care Processes: A Cohort Study, Page 11, Copyright (2023), with permission from Elsevier.*



Other studies underline the need to personalise post-discharge AKI care. Another study by Silver and colleagues (2021), for example, highlights reasons why patients may prefer not to return to secondary-care based clinics for their post-discharge AKI care (figure 9). Further studies evaluate models of care after AKI in North America (May, et al 2023; Bhatt et al. 2024; Caring for OutPatiEnts after Acute Kidney Injury (COPE-AKI) Consortium, on-going).

Figure 9: *Major adverse outcomes common after hospitalisation with AKI, but secondary care-based follow-up can pose a variety of barriers, unacceptable to many patients. Reprinted from Silver SA, Adhikari NK, Bell CM, et al., Nephrologist Follow-Up versus Usual Care after an Acute Kidney Injury Hospitalization (FUSION): A Randomized Controlled Trial, Clinical Journal of the American Society of Nephrology, Vol. 16, Issue 7, pp. 1005-1014, July 1, 2021. Available at: https://doi.org/10.2215/CJN.17331120. Used with permission from Wolters Kluwer Health, Inc.*



In the UK, Sharathchandra and colleagues (2023) report enhanced and timely follow-up of patients discharged with unrecovered renal function post AKI, in a multi-professional AKI clinic, was associated with a relatively low 30-day readmission rate (7.3%), compared to 30 day readmission rates reported elsewhere (eg 20% readmission rate, Silver et al, 2017), but these differences may reflect a selective patient subset. Unpublished data from other centres suggest similar multi-professional AKI clinics have also reduced early hospital readmission (Southampton, Calderdale & Huddersfield) and / or reduced length of hospital stay associated with AKI (Southampton, Aintree, St Helen's & Knowsley). Hospitals currently providing such AKI clinics report they aim to:

1. Reduce length of hospital stay associated with AKI, by securing safe and timely post-discharge care.

2. Reduce post-discharge complications related to medication cessation, including worsening heart failure or diabetic complications.

3. Reduce avoidable hospital readmission by, for example, ensuring secure and timely management of long-term conditions such as heart failure.

4. Identify and optimise management of de novo or worsening CKD, post AKI.

5. (In addition to post-AKI care) reduce unnecessary hospital admissions by providing timely repeat blood tests and clinical review, for patients found to have unexpectedly abnormal kidney tests results in community settings or clinics. Many patients are admitted to hospital unnecessarily in such circumstances, especially when abnormal test results return to 'out of hours' Primary Care services.

24. AKI discharge documentation must be clear and timely. It must state the cause of AKI and the post-discharge care plan, including if or when to restart any medication suspended at the time of AKI.

The Royal College of General Practitioners AKI Working Group found securing very early review for highest risk patients (as per figure 7) in Primary Care, is frequently challenged by unprecedented service pressures (see recommendation 23) and untimely or insufficient hospital discharge information (Royal College of General Practitioners AKI Working Group, 2018).

If a patient has sustained AKI, this should be included within timely discharge communication to ensure the AKI episode is appropriately recorded and coded within hospital and primary care databases. AKI is not a diagnosis and thus the cause of AKI should be included, together with the kidney function at discharge; this is especially important if recovery of kidney function post-AKI is incomplete.

The discharge communication should document post-AKI care responsibility (recommendation 22) and proposed follow-up plan (recommendation 23), including advice about if or when any medication should be restarted post-AKI (as per recommendations 8, 9 and 14).

Discharge planning and communication should ensure patients and carers are informed of test results and follow-up plans, as per Standards for the communication of patient diagnostic test results on discharge from hospital (2016).

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