Recommended Minimum Requirements of a Care Bundle for Patients with AKI in Hospital

Original Publication date December 2015
Reviewed March 2020
Review March 2022

Think Kidneys is a national programme led by
NHS England in partnership with UK Renal Registry

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Introduction

This document has been prepared as a guidance template of minimal requirements for care bundles for acute kidney injury (AKI) detected within hospital and which also allows additional tailoring according to local needs. It is primarily aimed at those hospitals without an AKI care bundle but gives those with existing packages a framework to ensure these meet national recommendations. This guidance is not intended to replace AKI care bundles where these are well established. Indeed, it has been developed following review of a number that have been generously shared by units from across the country following a national scoping exercise conducted by members of the intervention work-stream (see Appendix 9 for acknowledgements).

While there is still limited evidence demonstrating a benefit from use of these bundles, these have been initiated according to expert opinion on best practice and adapted, where necessary, according to subsequent local experience. It can be seen that there are a number of common themes running across all care bundles suggesting that, despite the current absence of a firm evidence base, the national experience can be distilled into the generic recommendations in this document. It should be noted, however, that what might constitute the 'optimal' AKI care bundle may change as the evidence base evolves.

The present intervention is aimed at patients in hospital who have developed AKI and is intended as a response strategy once AKI has been detected either clinically or via an e-alert or other mechanism. Many of these measures should also be followed in any patient who is at risk of AKI. However, recommendations on proposed mechanisms by which patients at risk of AKI are identified and managed are being reviewed by the Risk Work-stream and therefore fall outside this document (although there will inevitably be some overlap).

This guidance comprises 3 components:

1. **Contents of care bundle in 'ready-reference' guide:** a single page easy reference document which may be used as the basis for Trusts to develop a local care bundle for clinical use and which would allow easy audit or subsequent quality improvement work. The target audience for this would typically be the ward staff looking after the patient – usually a combination of nursing staff and junior medical staff. It aims to guide the end-user through the key themes in AKI management and facilitate completion. This may be presented electronically (as part of an e-Alert or accessed via hyperlink), as an additional document to be printed and added to the clinical notes, or as a hard copy (to be posted as an educational tool in clinical areas). Some examples of established care bundles are given in appendix 8.

2. **Specific guidance:** this section lists the key themes of AKI management and their essential components

3. **Further information:** this section provides the detail on some of these specific components (e.g. indications for renal support, fluid management, management of hyperkalaemia). Where national or international guidance exists, these have been used, preferentially.

1. Care bundle minimum requirements – a 'ready-reference' guide

Once AKI has been detected and verified (i.e. non-AKI rises in creatinine excluded, such as post-pregnancy), institution of a care bundle for AKI is recommended. The following sections should be included when developing a locally agreed care bundle:

INITIAL ASSESSMENT
- ABCDE assessment (follow NICE CG50) ☐
- Observations – check NEWS score ☐
- Look for signs of sepsis ☐
- Abdominal palpation looking for full bladder ☐

INITIAL TREATMENT
- Prompt treatment of sepsis (start Sepsis Six care bundle) ☐
- Fluid challenges if hypovolaemic/hypotensive ☐
- Medication review
  - Stop potentially harmful drugs ☐
  - Check for dose adjustments in AKI ☐
- Relieve obstruction (see guidance) ☐

Core elements of initial bundle
(May be used as a separate audit tool if appropriate)

INDICATIONS FOR IMMEDIATE REFERRAL
- RENAL
  - Complications of AKI refractory to medical treatment ☐
  - Indications for dialysis ☐
  - Likely intrinsic renal disease / systemic vasculitis ☐
  - AKI (any stage) in a renal transplant patient ☐
- UROLOGY (AND/OR RADIOLOGY)
  - Obstruction not relieved by catheter, or if pyonephrosis ☐
- CRICITAL CARE
  - Multi-organ failure ☐
  - Haemodynamic instability (follow NICE CG50) ☐

FURTHER INVESTIGATION
- Cultures for source of sepsis ☐
- Urinalysis ☐
- Lactate if severe sepsis / hypoperfusion ☐
- ABG and Venous bloods (including bicarbonate) ☐
- USS within 24° unless cause clear/recovering ☐
- Other tests based on clinical suspicion (see guidelines) ☐

ONGOING MONITORING
- Initiate IP/OP fluid balance chart / Daily weights ☐
- Daily clinical (including volume) assessment (& use NEWS score) ☐
- Regular venous bloods (U&E, etc) ☐
- Daily drug dosing review ☐
- Nutritional assessment ☐

SPECIALIST REFERRAL WITHIN 24 HOURS
- RENAL - AKI (any stage) not recovering ☐
- UROLOGY - Obstruction on USS ☐

2. Specific guidance supporting care bundle requirements

1. INITIAL ASSESSMENT
2. INITIAL TREATMENT
3. INDICATIONS FOR IMMEDIATE REFERRAL
4. FURTHER INVESTIGATION
5. ONGOING MONITORING
6. SPECIALIST REFERRAL

Supporting guidance in the management of new cases of AKI which can be used in conjunction with each theme of the care bundle is listed below:

1. INITIAL ASSESSMENT
    - **Assessment for complications of AKI including**
        - **Pulmonary oedema**
        - **Tachypnoea (suggesting fluid overload and/or acidosis)**
        - **Pericardial / pleural rub**
        - **Neurological manifestations of uraemia, e.g. encephalopathy (having excluded other causes of confusion/delirium)**

    - Full set of physiological observations
        - NEWS triggers to be applied according to local protocol
        - Follow NICE CG50 guidelines ('Management of the Acutely Ill Patient')

    - ABCDE examination to include
        - Any evidence of sepsis – start Sepsis Six Care Bundle
        - Haemodynamic (including volume) assessment
            - Signs of shock / hypoperfusion (see also appendix 5)?
        - Reagent strip urinalysis – documented in medical notes
        - Palpation for enlarged bladder
        - Evidence of vascular disease
        - Signs suggestive of a less common cause (e.g. vasculitis) (see appendix 4)

    - Relevant clinical history including:
        - Possible precipitants and risk factors also requiring full medication history (prescribed and non-prescribed drugs; iodinated radio-contrast investigations)
        - History of urinary tract symptoms
        - History suggestive of sepsis
        - History of vascular disease or recent vascular intervention (is cholesterol embolization possible?)
        - Systemic symptoms suggestive of a less common cause of AKI (e.g. vasculitis) (see appendix 4)

2. INITIAL TREATMENT
    - Prompt treatment of sepsis (see appendix 6)

    - If hypovolaemic, crystalloid boluses until fluid replete with regular clinical reviews of response
        - Maintenance fluids only once euvolaemic
        - Set daily fluid target (see appendix 5: NICE CG174 –' IV fluid therapy in adults in hospital')

    - Medications
        - Stop medications which could be potentially harmful in AKI (e.g. ACEi / ARB / NSAIDs)
        - Review need for drug dose adjustment in view of AKI (see medicines management tool)
        - Remember physiological effects of some drugs – e.g. Trimethoprim causing hyperkalaemia and physiologically increasing serum creatinine levels

    - Relieve obstruction
        - Apart from in cases of urinary tract obstruction, the decision to place a urethral catheter should consider the individual risks (including trauma, infection, falls risk) and benefits (e.g. accuracy of urine OP recording, avoidance of skin breakdown associated with incontinence) for the patient.
        - The urethral catheter should be removed if it has been demonstrated that the patient remains anuric despite therapeutic interventions to restore circulating volume.
        - In cases of upper tract obstruction, clear referral pathways with urology or interventional radiology should be established as appropriate locally (e.g. for ureteric stenting or nephrostomy placement)

3. IDENTIFY LIFE-THREATENING COMPLICATIONS
    - Is there an indication for urgent dialysis? (see appendix 1)
        - **Contact critical care or local renal service immediately**
    - Management of hyperkalaemia (see appendix 2)
    - Management of pulmonary oedema and severe metabolic acidosis (see appendix 3)

    - **If hyperkalaemia / pulmonary oedema cannot be managed medically, contact critical care or local renal service immediately for further advice, according to local protocol**

NB. Local guidelines describing the appropriate pathways for referral for renal / critical care support 24 hours a day should be included in any guidance and included in induction for staff. This may involve on-site specialist nephrology support or referral to another local centre for specialist advice or transfer.

4. INVESTIGATION
    - If sepsis possible, culture blood/urine, etc.
        - where relevant, arrange appropriate imaging (see also appendix 6)
    - If urinalysis positive for blood and protein, consider causes of intrinsic renal disease (see below)
    - Venous bloods – urea and electrolytes, adjusted calcium, albumin, phosphate, bicarbonate, liver function tests, glucose, full blood count, coagulation profile, CRP
    - Arterial blood gases with lactate if severe sepsis / hypoperfusion
    - Urgent renal tract ultrasound within 6 hours if pyonephrosis or high index of suspicion for upper urinary tract obstruction
    - Otherwise, renal tract ultrasound within 24 hours unless clear cause of AKI or if AKI recovering
    - Based on degree of clinical suspicion (see also appendix 4), consider
        - Auto-antibody testing (anti-neutrophil cytoplasmic antibodies, anti-nuclear antibodies, anti-glomerular basement membrane antibodies) and serum complements, especially if blood and protein on reagent strip urinalysis
        - Myeloma screen, especially if hypercalcaemia, hyperuricaemia, bone pain or other features suggesting this diagnosis
        - Serum creatine kinase(CK) if long lie, trauma, IV drug use, vascular occlusion, etc.
        - Serum lactate dehydrogenase (LDH), blood film, reticulocyte count if suspicion of haemolytic uraemic syndrome
        - Review differential white cell count - eosinophilia may suggest an underlying acute allergic interstitial nephritis or atheromatous embolism

5. MONITORING
    - Regular* U&Es, adjusted calcium, albumin, phosphate, bicarbonate, liver function tests, glucose, full blood count, (C-reactive protein if indicated)
        * this will generally be daily until recovery or until clinically stable
    - Maintain vigilance for sepsis – investigate and treat, promptly if clinical suspicion
    - Strict input-output fluid balance charting
        - Hourly urine output if catheterised, 4-hourly if not
    - Daily weights
    - Physiological observations as per local protocol (e.g. NEWS score)
    - Daily clinical examination including volume / haemodynamic assessment
    - Daily review of medications and need for dose adjustments
    - Nutritional assessment (see appendix 7)

6. REFERRAL to one or more of:
    - Renal, if
        i. stage 3 AKI
        ii. a systemic inflammatory cause is possible
            1. blood / protein on dipstick and no clear precipitant for AKI of any stage – e.g. stage 1 AKI may represent early vasculitis
        iii. stage 2 AKI and failing to recover
        iv. complications of AKI failing to respond to medical treatment
        v. there is an indication for dialysis
    - Critical care (often before renal if no onsite nephrology service), if
        i. NEWS requires this (see NICE CG50 guidance)
        ii. multi-organ failure
        iii. haemodynamically unstable
    - Urology if obstruction

Appendix 1: Indications for starting renal replacement therapy

(adapted from Renal Association clinical practice guideline for AKI, available at http://www.renal.org/guidelines/modules/acute-kidney-injury#sthash.PaFAGMt3.dpbs)

Biochemical indications	
	Refractory hyperkalaemia > 6.5 mmol/l
	Serum urea > 27 mmol/l
	Refractory metabolic acidosis pH < 7.15
	Refractory electrolyte abnormalities: Hyponatraemia, hypernatraemia or hypercalcaemia
	Tumour lysis syndrome with hyperuricaemia and hyperphosphataemia
	Urea cycle defects, and organic acidurias resulting in hyperammonaemia, methymalonic acidaemia
Clinical indications	
	Urine output < 0.3 ml/kg for 24 h or absolute anuria for 12 h
	AKI with multiple organ failure
	Refractory volume overload
	End organ involvement: pericarditis, encephalopathy, neuropathy, myopathy, uraemic bleeding
	Creation of intravascular space for plasma and other blood product infusions and nutrition
	Severe poisoning or drug overdose
	Severe hypothermia or hyperthermia

Appendix 2: Management of hyperkalaemia

It is expected that most Trusts will have local guidelines for the acute management of hyperkalaemia. However, joint guidelines are available at:

http://www.renal.org/guidelines/joint-guidelines/treatment-of-acute-hyperkalaemia-in-adults#bae29f31-1815-6165-9443-ff000014d4d8

Within these guidelines, particular attention is drawn to useful algorithms at:

- appendix 2: drug administration and safety
- appendix 5: algorithm - management of hyperkalaemia in adults
- appendix 6: algorithm – management of hyperkalaemic cardiac arrest in adults

Appendix 3: Management of pulmonary oedema and metabolic acidosis

1. Pulmonary oedema	•High-flow oxygen and, if available, continuous positive airway pressure ventilation •Intravenous furosemide: doses of 40–80 mg or higher can be used, but should not delay more definitive management with renal support if unsuccessful. Has no role in 'treating' or preventing AKI, per se. •Intravenous nitrates: may be a useful holding measure but should not delay definitive management with renal support if this is required •Venesection could be considered as a strategy to offload the patient if above measure fail and renal replacement therapy is not readily available
2. Severe metabolic acidosis (pH<7.2)	•Give 200–500 ml of 1.26% or 1.4% sodium bicarbonate intravenously over 15–60 minutes. This should only be used if venous bicarbonate is <16 mmol/litre with no evidence of volume overload. Ionized Ca^{2+} falls with rapid correction and can trigger tetany, seizures and cardiac instability. Correct low ionized Ca^{2+} via different intravenous route due to incompatibility of bicarbonate and calcium solutions.

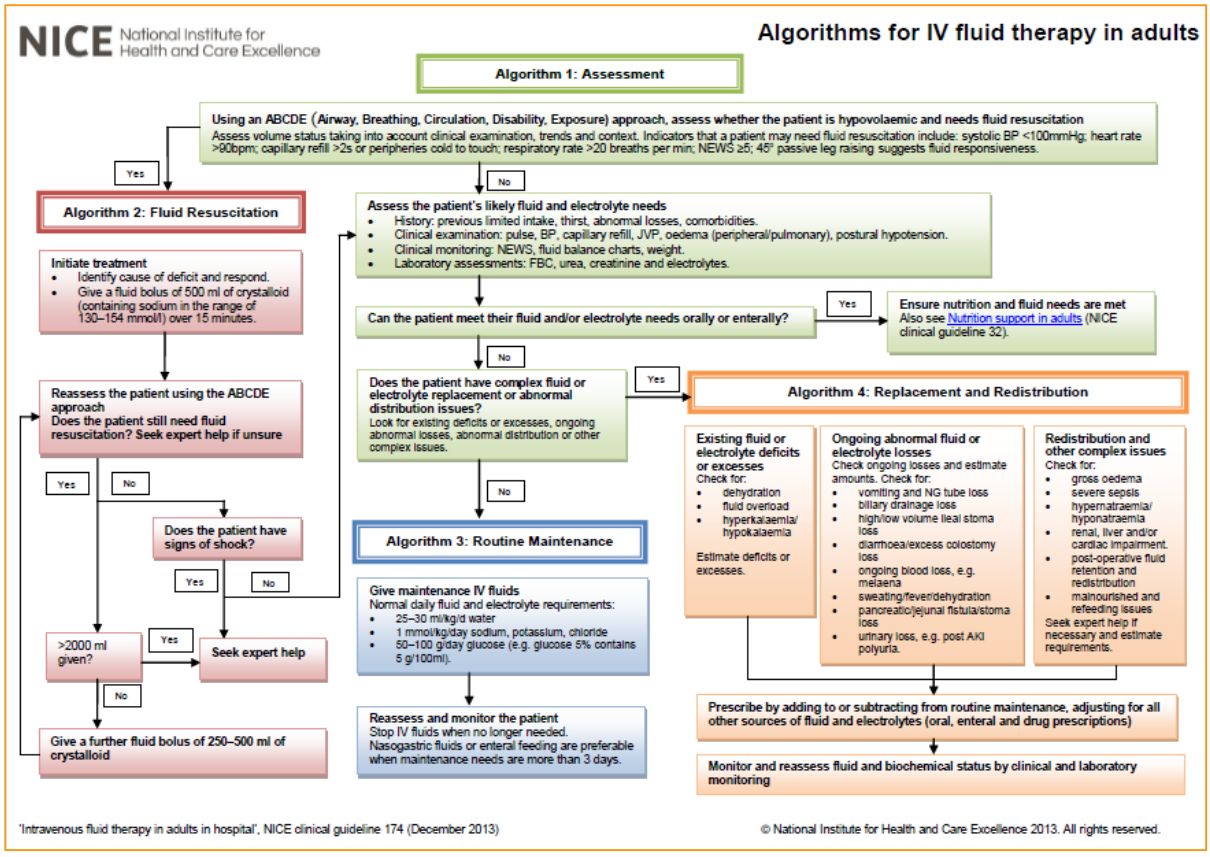
NB. If the above measures fail, early liaison with critical care or local nephrology services is essential to arrange renal replacement therapy

Appendix 4: Clinical and laboratory features suggesting a rare diagnosis

Symptom	Possible diagnoses
Fever, arthralgias, rashes	Small vessel vasculitis (e.g. granulomatosis with polyangiitis, microscopic polyangiitis), SLE, anti-glomerular basement membrane antibody disease
Haemoptysis	Small vessel vasculitis, anti-glomerular basement membrane antibody disease
Haemolysis, thrombocytopenia	Haemolytic–uraemic syndrome
Hypercalcaemia, hyperuricaemia, bone pain, lytic lesions	Multiple myeloma
Recent vascular intervention ± livedo reticularis, hypo-complementaemia	Cholesterol emboli syndrome
Raised serum creatinine, creatine kinase >10,000 U/litre, prolonged severe immobility, crush injuries	Rhabdomyolysis

Appendix 5: Algorithms for IV fluid therapy in adults

From NICE clinical guideline 174 - Intravenous fluid therapy in adults in hospital
https://www.nice.org.uk/guidance/cg174



Appendix 6: Sepsis care bundle

SURVIVING SEPSIS CAMPAIGN BUNDLES

TO BE COMPLETED WITHIN 3 HOURS:

1) Measure lactate level
2) Obtain blood cultures prior to administration of antibiotics
3) Administer broad spectrum antibiotics
4) Administer 30 mL/kg crystalloid for hypotension or lactate ≥ 4mmol/L

TO BE COMPLETED WITHIN 6 HOURS:

5) Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg
6) In the event of persistent arterial hypotension despite volume resuscitation (septic shock) or initial lactate ≥ 4 mmol/L (36 mg/dL):
   - Measure central venous pressure (CVP)*
   - Measure central venous oxygen saturation ($Scvo_2$)*
7) Remeasure lactate if initial lactate was elevated*

*Targets for quantitative resuscitation included in the guidelines are CVP of ≥ 8mm Hg, $Scvo_2$ of ≥70%, and normalization of lactate.

From Dellinger RP, Levy MM, Rhodes A, et al: Surviving Sepsis Campaign: International Guidelines for Management of Severe Sepsis and Septic Shock: 2012. *Crit CareMed* 2013; 41:580-637.

For further information, see www.survivingsepsis.org

Appendix 7: Nutritional management

Suggested management is largely based on expert opinion:

- Achieve a total energy intake of20–30 kcal/kg/d in patients with any stage of AKI
- Avoid restriction of protein intake with the aim of preventing or delaying initiation of RRT
- Administer 0.8–1.0 g/kg/d of protein non-catabolic AKI patients without need for dialysis, 1.0–1.5 g/kg/d in patients with AKI on RRT, and up to a maximum of 1.7 g/kg/d in patients on continuous renal replacement therapy (CRRT) and in hypercatabolic patients.

Taken from:
KDIGO Clinical Practice Guideline for Acute Kidney Injury
Kidney International Supplements (2012) 2, 1; doi:10.1038/kisup.2012.1
Chapter 3.3: Glycaemic control and nutritional support, pp 45-6

Further nutritional guidance can be found in the following section on the ***'Think Kidneys'*** *website*:

https://www.thinkkidneys.nhs.uk/aki/resources/Secondary%20Care/

Appendix 8: Examples of established or published AKI Care Bundles

London AKI network
http://www.londonaki.net/downloads/LondonAKInetwork-STOPAKIchecklist.pdf

Royal Berkshire NHS Foundation Trust
http://www.royalberkshire.nhs.uk/Downloads/GPs/GP%20protocols%20and%20guidelines/AKI/AKI%20care%20bundle_8Jun.pdf

Guy's and St Thomas' NHS Foundation Trust

Joslin J, Wilson H, Zubli D, Gauge N, Kinirons M, Hopper A, Pile T, Ostermann M.

Recognition and management of acute kidney injury in hospitalised patients can be partially improved with the use of a care bundle.
Clin Med 2015; **15(5):** 431-436

Derby Hospitals NHS Foundation Trust (Royal Derby Hospital)
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0132279

Aintree University Hospital
http://ndt.oxfordjournals.org/content/30/suppl_3/iii467.4.extract#

Appendix 9: Acknowledgments

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- The British Renal Society
- The Society of Acute Medicine
- The British Geriatrics Society

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