

Acute Kidney Injury Best Practice Guidance for Undergraduate Nurse Educators

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Disclaimer

To the best of our knowledge, the contents of this publication are in line with National Institute for Health and Care Excellence guidance relating to the management and treatment of acute kidney injury.

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1. Introduction

This guidance provides information for nurse educators teaching student nurses about acute kidney injury (AKI).

This guide forms part of a package of resources for undergraduate nurse educators. Lesson plans have been developed for use when teaching first, second and third year students, along with slide sets to use in the classroom setting.

Later in this guide you will find links to the slide sets, which can be downloaded and adapted for your own use. The appendices at the end include lesson plans for each year group.

What is AKI?

AKI is a sudden reduction in renal function that makes maintaining fluid, electrolyte and acid-base balance difficult. The term has replaced 'acute renal failure' and includes earlier stages of kidney damage other than just 'failure'.¹ The diagnosis of AKI and its staging is based on acute changes in serum creatinine and/or a reduction in urine output.^{1,2} It is not a traumatic injury to the kidney as the name may imply, rather a clinical syndrome with various causes and variable outcomes.¹

What causes AKI?

There are many causes of AKI. Most cases occur in conjunction with co-existing acute illness and are a result of infection, hypovolaemia, hypotension or medication effects; these causes, often in combination, account for up to 80% of cases, on a background of increased risk.¹⁻⁴ Patients at risk are often frail with co-morbidities including diabetes, chronic kidney disease (CKD), chronic liver disease and heart failure. Post-renal causes (e.g. bladder outflow obstruction) accounts for between 5 to 10% of cases of AKI.³ Intrinsic kidney diseases are less common, but it is important they are not missed because early access to specialised management in these cases is crucial. This category includes a variety of less common conditions such as: systemic vasculitis, rapidly progressive glomerulonephritis, drug induced tubulo-interstitial nephritis, and myeloma-related kidney disease.

Any drug that reduces blood pressure, circulating volume, or renal blood flow may increase the risk of AKI. Non-Steroidal Anti Inflammatory Drugs (NSAIDs) reduce renal blood flow by reducing intrarenal vasodilator prostaglandins. Diuretics may worsen hypovolaemia. All blood-pressure-lowering drugs should be reviewed in acute illness. In addition to their effect on blood pressure, ACE inhibitors (ACEi) and angiotensin II receptor blockers (ARB) also reduce the ability of the kidney to adapt to changes in perfusion pressure. One of the actions of ACEi and ARB that account for their reno-protective effects in diabetic nephropathy and proteinuric CKD is the reduction in efferent glomerular arteriolar tone. However, this action also reduces the ability to maintain glomerular filtration pressure in the face of hypovolaemia/hypotension. ACEi and ARB also increase the risk of hyperkalaemia by inhibiting aldosterone production¹¹.

Why is early recognition of AKI important?

AKI is extremely common in hospitalised patients, occurring in 10-20% of emergency hospital admissions, and is associated with extremely poor outcomes.⁵ However, AKI is not just a secondary

care problem – primary care has a crucial role to play, particularly in prevention, early detection and management, as well as provision of post-AKI care.

Poor outcomes associated with AKI include:

- Extremely high mortality rates (more than 20% of patients with AKI will die during hospital admission, rising to >35% in those with AKI stage 3)⁵
- Increased length of hospital stay and higher healthcare resource utilisation¹⁶
- Incomplete recovery of kidney function – many patients will be left with chronic kidney disease (CKD) and/or are at increased risk of progressive loss of GFR over time¹⁷
- Increased risk of poor long-term outcomes: reduced life expectancy, increased cardiovascular risk, and poorer quality of life¹

In part, these poor outcomes reflect the fact that AKI acts as a ‘force multiplier’ and increases severity of co-existing acute illness. **AKI is a marker of the ‘sick patient’ who requires prompt recognition and management.**

2. AKI in secondary care

Think Kidneys has developed a suite of resources for health and care professionals working in secondary care, which includes:

- [Minimum Care Bundle for Patients with AKI in Hospital](#) – the recommended minimum requirements of a care bundle for patients with AKI in hospital
- [Nutrition Guide](#) – an overview of nutritional considerations in the treatment of adult patients with AKI in hospital
- [Sick Day Guidance Statement](#) – an interim position statement from the Think Kidneys Board on ‘sick day’ guidance in patients at risk of AKI

3. AKI in primary care

Primary care plays an important role in the prevention and management of AKI and Think Kidneys has also produced resources for those working in this area:

- [Communities at risk of developing acute kidney injury](#) – publication detailing those most at risk of AKI
- [Medicines Optimisation for AKI](#)
- [Responding to AKI Warning Stage Test Results in Primary Care](#) – guidance for those working in primary care on how to respond to an AKI stage warning test result

- [Practical guide to AKI](#) – a pocket sized guide containing useful information for community staff
- [Recommended Response Times to AKI Warning Stage Test Results for Adults in Primary Care – Table 1](#)
- [Recognising and Responding to AKI in Primary Care – Table 2](#)

Think Prevention: Up to two-thirds of patients with AKI have already developed it by the time they are admitted to hospital, so preventative strategies need to include a focus on primary care. AKI Warning Stage Test Results generated from electronic detection systems in biochemistry labs are sent to primary care, which makes changes in serum creatinine concentration easier to spot. There is a need to ensure that these test results are considered in a clinical context, with an imperative of treating the patient, not the test result.

Post-AKI Care: Improvements are required at discharge from hospital for patients who have had an episode of care complicated by AKI.^{8,9} Patients who have recovered from AKI need clear plans for follow up. This includes

- 1) early review to assess the extent of renal recovery as well as review of long term medications that may have been stopped during admission (see When to restart drugs stopped during an episode of AKI); and
- 2) Longer-term monitoring to assess for the development or progression of CKD.⁷ Review appointments provide an opportunity to communicate the diagnosis of AKI and raise awareness of associated risks.

Community nurses play a vital role in realising the opportunities above. Their regular contact with high risk groups means that they are ideally situated to promote kidney health and potentially prevent AKI. Strategies should focus on raising awareness of AKI by promoting sick day guidance and educating patients about the signs of dehydration when they are unwell. When appropriate, advising patients to discuss their medication with community pharmacists is another proactive, preventative approach.

These messages should also be reinforced as part of post AKI care, where medications management and ongoing monitoring of renal function are also essential⁷. Ongoing needs will vary as some patients may not even know that they have had an episode AKI whereas others may be left with new or deteriorating CKD that will require liaison with local nephrology services.

When caring for those who are already unwell in the community, an understanding of AKI and its risk factors ensures that AKI is promptly recognised and effectively managed; possibly even preventing the progression of AKI from stages 1-2-3 and the subsequent need for hospitalisation.

4. Communities at risk of AKI

Older patients with chronic (long-term) medical conditions e.g. chronic kidney disease, diabetes mellitus, heart failure, cancer, and medications are at increased risk of AKI if they become acutely ill ². It is estimated that one in five emergency admissions into hospital are associated with AKI ². Up to 100,000 deaths in hospitals are associated with AKI and a quarter to a third could potentially be prevented as reported by the National Confidential Enquiry into Patient Outcome and Death ¹². The financial burden of AKI upon the NHS is significant with estimates indicating the cost is £1.02 billion in England for the acute care and £179 million following the episode related to an increase in patients with CKD and end stage kidney disease ⁶.

Full details of identifying communities at risk of AKI can be found in the Think Kidneys publication: “Communities at risk of developing acute kidney injury”, and can be found here: <https://www.thinkkidneys.nhs.uk/aki/wp-content/uploads/sites/2/2015/07/Communities-at-risk-v16.pdf>

5. Medicines Optimisation

AKI is the sudden loss of kidney function over a period of hours or days. Since the kidneys are one of the major excretory pathways for the removal of drugs from the body, this sudden loss of kidney function can have major implications for a patient’s prescribed medication regime. However, the term ‘nephrotoxic’ should be used with caution. Few medications truly have direct toxic effects on the kidneys, but several have the potential to impair renal function if used under certain circumstances, such as where the patient has a degree of chronic kidney disease in conjunction with hypovolaemia and acute illness. Under these circumstances, continued use of these medications may further exacerbate an episode of AKI. The ‘Think Kidneys’ Programme has taken the decision to avoid the use of the term nephrotoxic. In addition, many medications are cleared via the kidneys, so have the potential to accumulate during an episode of AKI. The result of this may be a further deterioration in kidney function, or there may be other adverse effects such as bone marrow or Central Nervous System (CNS) toxicity. Hence it is necessary to review the use of these medications, and amend the doses appropriate to the level of the patient’s renal function ¹¹.

Full details of medicines optimisation can be found in the “Think Kidneys publication: Guidelines for Medicines Optimisation in Patients with Acute Kidney Injury” and can be found here: <https://www.thinkkidneys.nhs.uk/aki/medicines-optimisation-for-aki/>

6. Educating the public

Ensuring nurses have a sound understanding of how to care for patients at risk of, or with acute kidney injury and/or kidney disease is vital. In a study by Thompson-Martin¹³ it was shown how a renal education programme for nurses in Primary Care can improve outcomes for patients with renal disease. Adhikari¹⁴ discusses the importance of educating nurses about renal disease whether working in renal or non-renal areas, in primary/community care and hospital environments. This highlights how all nurses are well placed and play a key role in monitoring and identifying those most at risk of developing kidney problems, in initiating early interventions to prevent progression and the importance of communicating effectively with the multidisciplinary team and the patient and their relatives/carers. These roles are further supported by NICE Clinical guidelines CG169 - Acute kidney injury: prevention, detection and management and CG182 - Chronic kidney disease in adults: assessment and management, as well as the NMC Code of Conduct. Through both the education of staff and patients, we can have an impact on the incidence of AKI and the long term ramifications of this.

The 'Think Kidneys' programme commissioned a survey from Ipsos MORI to gain an understanding of the level of knowledge amongst the general public about their kidneys and what they do. The survey findings demonstrated the need for a public campaign to educate people about their kidneys.

Full details of the survey are in the Think Kidneys publication: "Understanding what the public know about their kidneys and what they do" and can be found here:

<https://www.thinkkidneys.nhs.uk/aki/wp-content/uploads/sites/2/2015/01/Think-Kidneys-Report-Understanding-what-the-public-know-Nov-15.pdf>

Think Kidneys launched a public campaign in the summer of 2016, this included a set of posters giving information about the kidneys, and a short video which can be accessed here:

<https://www.thinkkidneys.nhs.uk/campaign/>

7. Further reading and useful resources

Further resources can be found on the Think Kidneys website:

<https://www.thinkkidneys.nhs.uk/aki/think-kidney-publications/>

Think Kidneys have developed a phone app containing many of the Think Kidneys resources. You can download your app here:

-  [Apple](#)
-  [Android](#)

[Mental Health](#)

Guidance for mental health professionals on the management of acute kidney injury – Guidance on the multi-disciplinary approach required to identify, manage, prevent and treat mental health patients at risk of or with AKI

Recognising and Responding to Acute Kidney Injury for Adults in Mental Health facilities – Understanding cause, possible medication factors, fluid volume status and options for review.




Recommended response times to AKI Warning Stage Test Results for Adults in Mental Health facilities – This at-a-glance resource explains what actions to take when, when to treat or when to refer.

Paediatrics

Guidance for clinicians managing children at risk of, or with, acute kidney injury – This guidance is for doctors, nurses and allied healthcare professionals looking after children. It is therefore written in a manner to be accessible to all groups. It is intended to improve the care of children at risk of, or with, Acute Kidney Injury (AKI).

8. Teaching student nurses

Nurse educators can use the AKI lesson plans at the end of this guide when teaching student nurses. There are three plans, for first, second and third year students. Slide sets have been developed for use when teaching, and these can be accessed using the following links. They can be downloaded and edited for use to suit local requirements:

-  [Year one slide set](#)
-  [Year two slide set](#)
-  [Year three slide set](#)

Additional teaching resources

Seminar

To support the education resources a seminar and video has been produced. These can be used to support knowledge and understanding in regard to management of a patient with Acute Kidney Injury. The seminar is designed to encourage discussion and group work to illicit understanding around the topic. The use of the video is to support either the lecture or the seminar and can be used as an alternate teaching aid. These resources would be useful for final year nursing students.

Video to support the seminar: <https://youtu.be/9YnqCzfDAGg>

Lesson plans

These are appendices 1-3 and can be used or adapted as required

Scenarios

The scenarios in appendices 4-9 can be used to encourage students to think about the risk factors associated with AKI. Small groups can be given individual cases to explore then feed

back to the class, a list of AKI risk factors is included for ease. Risk factors are also included in appendix ten.

9. References

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Karen Thomas, Head of Programmes, UK Renal Registry

Appendix One:

Lesson Plan – Acute Kidney Injury for Year 1 Undergraduate Nurses

Title: Introduction to the urinary system and Acute Kidney Injury (AKI)				
Time: 2 hours				
Objective: To provide undergraduate nurses with an overview of the anatomy, physiology and functions of the urinary system and the kidneys, with an introduction to AKI and its associated risk factors.				
Time	Content	Educator activity	Student activity	Teaching aids
5 minutes	Overview of the session	<ul style="list-style-type: none"> • Explanation of session content • Establish groups previous knowledge and experience of the kidneys and AKI • Answer any questions 	<ul style="list-style-type: none"> • Listening • Active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> Educator's notes
30 minutes	PowerPoint with video links	<ul style="list-style-type: none"> • Run slides for Anatomy and Physiology (A&P) and functions of the kidney/urinary system • Encourage interaction / discussion during slide show • Questions and answers 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> Play video on basic urine formation <input type="checkbox"/> 'Think Kidney's 'Everything you need to know...' video <input type="checkbox"/> "Think Kidneys" PowerPoint slides <input type="checkbox"/> Educator's notes
10 minutes	Kidney dysfunction Definition of Chronic Kidney Disease (CKD) and AKI Key AKI facts	<ul style="list-style-type: none"> • Ask what student understanding is of these terms • Explanation from slide • Encourage interaction / discussion 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> 'Why we need to Think Kidneys' video

‘THINK KIDNEYS’

15 minutes	Acute Kidney Injury: Risk factors	<ul style="list-style-type: none"> • PowerPoint presentation • Ask students what they think the risk factors for AKI could be 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> “Think Kidneys” PowerPoint AKI slides
10 minutes	Break			
45 minutes	Causes of AKI Urinalysis Focus on dehydration	<ul style="list-style-type: none"> • Ask students to identify possible causes of AKI (or have pre-prepared causes to use as group work) and state whether they are pre, intra or post renal causes. • Presentation of slides • Opportunities to ask questions 	<ul style="list-style-type: none"> • Participate in group work and feedback • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> Could have some prepared causes of AKI for students to identify if they are pre, intra or post renal causes. Could do this as group work. <input type="checkbox"/> PowerPoint
10 minutes	Summary	<ul style="list-style-type: none"> • Summarise key learning points • Questions and answers 	<ul style="list-style-type: none"> • Questions 	<input type="checkbox"/> PowerPoint / educator’s notes
5 minutes	Evaluations and close		<ul style="list-style-type: none"> • Students to fill in evaluations 	<input type="checkbox"/> Evaluation forms



Appendix Two:

Lesson Plan – Acute Kidney Injury for Year 2 Undergraduate Nurses

Title:	Revisiting the renal system and overview of Acute Kidney Injury (AKI)
Time:	2 hours
Objective:	To provide undergraduate nurses with an understanding of the role of the kidneys, with consideration of how to identify AKI and an overview of the management of AKI.

Time	Content	Educator activity	Student activity	Teaching aids
5 minutes	Overview of the session	<ul style="list-style-type: none"> • Explanation of session content • Establish groups previous knowledge and experience of the kidneys and AKI • Answer any questions 	<ul style="list-style-type: none"> • Listening • Active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> Educator’s notes
20 minutes	PowerPoint with discussion	<ul style="list-style-type: none"> • Run slides for 2-9 discuss what the slides mean. • Use poll questions on slide 5,6, 7, 8 to identify student knowledge. • Encourage interaction / discussion during slide show • Questions and answers 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions • Engage in Poll 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> White board to undertake poll <input type="checkbox"/> “Think Kidneys” PowerPoint slides <input type="checkbox"/> Educator’s notes
10 minutes	Overview of the kidney	<ul style="list-style-type: none"> • Ask students where the kidneys are located, the function of the nephron and the role of the glomerulus 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> White board <input type="checkbox"/> Educator’s notes

‘THINK KIDNEYS’

		<ul style="list-style-type: none"> • Spend 5 minutes eliciting knowledge in regard to the functions of the kidney • Encourage interaction / discussion 		
15 minutes	Definition, risk factors and classification of AKI	<ul style="list-style-type: none"> • PowerPoint presentation • Ask students what experience they have had with patients with AKI • Ask the students if they are aware of any risk factors for AKI. 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions • Elicit discussion in regard to experience of looking after a patient with AKI. Draw on relevant experience 	<input type="checkbox"/> “Think Kidneys” PowerPoint AKI slides <input type="checkbox"/> Educator’s notes
10 minutes	Identification of AKI looking at Urine output and creatinine level	<ul style="list-style-type: none"> • Discussion on measuring urine output and taking bloods. How can this be dealt with in terms of community patients? • 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions • Elicit discussion in regard to community patients. 	<input type="checkbox"/> “Think Kidneys” PowerPoint AKI slides <input type="checkbox"/> Educator’s notes
40 minutes	Complications and management	<ul style="list-style-type: none"> • Ask students to identify possible complications of AKI using the 9 functions as a guide. • Presentation of slides • Opportunities to ask questions 	<ul style="list-style-type: none"> • Participate in group work and feedback • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> “Think Kidneys” PowerPoint AKI slides <input type="checkbox"/> Whiteboard <input type="checkbox"/> PowerPoint
10 minutes	Care Bundles, on-going management and prevention,	<ul style="list-style-type: none"> • Ask about experience with care bundles. Have they seen one in practice? • Discuss prevention 	<ul style="list-style-type: none"> • 	<input type="checkbox"/>
10 minutes	Summary and questions	<ul style="list-style-type: none"> • Summarise key learning points • Questions and answers 	<ul style="list-style-type: none"> • Questions 	<input type="checkbox"/> PowerPoint / educator’s notes



Appendix Three:

Lesson Plan – Acute Kidney Injury for Year 3 Undergraduate Nurses

<p>Title: In depth look at identification, assessment and management of a patient with Acute Kidney Injury (AKI)</p> <p>Time: 2 hours</p> <p>Objective: To provide undergraduate nurses with an understanding of the importance of prompt assessment and management of a patient who is at risk of AKI and has developed AKI.</p>				
Time	Content	Educator activity	Student activity	Teaching aids
5 minutes	Overview of the session	<ul style="list-style-type: none"> • Explanation of session content • Establish groups previous knowledge and experience of the kidneys and AKI • Answer any questions 	<ul style="list-style-type: none"> • Listening • Active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> Educator’s notes
10 minutes	PowerPoint with discussion	<ul style="list-style-type: none"> • Run slides for 3-7 discuss what the slides mean and the students prior knowledge of staging, terms and introduction to NCEPOD study • Encourage interaction / discussion during slide show • Questions and answers 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> “Think Kidneys” PowerPoint slides <input type="checkbox"/> Educator’s notes
30 minutes	Recap the functions of the kidney. Assessment, risk factors	<ul style="list-style-type: none"> • Ask students the functions of the kidney. • Encourage interaction / discussion around complications of AKI (fluid overload, high k+ etc...) 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> PowerPoint <input type="checkbox"/> White board <input type="checkbox"/> Educator’s notes

10 minutes	Management and sign pointing to care Pathways, London AKI network and Think Kidneys	<ul style="list-style-type: none"> • PowerPoint presentation 	<ul style="list-style-type: none"> • Watch, listen, active engagement • Ask questions • Elicit discussion in regard to experience of looking after a patient with AKI 	<input type="checkbox"/> “Think Kidneys” PowerPoint AKI slides
10 minutes	Break			
50 minutes	Case study analysis	<ul style="list-style-type: none"> • Work through case study looking at causes, risk factors, stages and medication. • Presentation of slides • Opportunities to ask questions or undertake group work and feedback 	<ul style="list-style-type: none"> • Participate in group work as necessary and feedback • Watch, listen, active engagement • Ask questions 	<input type="checkbox"/> Working out the stage and identifying risk factors can be undertaken as group work. <input type="checkbox"/> PowerPoint <input type="checkbox"/> Whiteboard
10 minutes	Summary	<ul style="list-style-type: none"> • Summarise key learning points • Questions and answers 	<ul style="list-style-type: none"> • Questions 	<input type="checkbox"/> PowerPoint / educator’s notes
5 minutes	Evaluations and close		<ul style="list-style-type: none"> • Students to fill in evaluations 	<input type="checkbox"/> Evaluation forms

Appendix Four

What are the risk factors for AKI?

<p>Situation</p>	<p>58 year old gentleman admitted 2 days ago for elective hip replacement under a spinal anaesthetic.</p>
<p>Background</p>	<p><u>Past medical history:</u></p> <p>Osteoarthritis left hip Type 2 Diabetes Mellitus Hypertension</p>
<p>Assessment</p>	<p>Observations: BP 102/70, HR 85, RR 16, SpO2 96% on room air, Temp 36.9, CBG 7.2</p> <p>No fluid balance chart. Patient reports on going nausea and hasn't been drinking much. Intra Venous Fluids (IVF) prescribed but not started yet. Hip dressing clean and dry</p> <p><u>Medications:</u></p> <p>Ramipril 10mg BD Metformin 1mg BD Linagliptin 5mg OD Ibuprofen 400mgs TDS</p>



Appendix Five

What are the risk factors for AKI?

Situation	72 year old female admitted after a fall. She lives alone and was on the floor for 10 hours before being found.
Background	<u>Past medical history:</u> Hypertension Cellulitis Arthritis left knee and hip
Assessment	Observations: BP 115/76, HR 82, RR 18, SpO2 97% on room air, Temp 36.2 <u>Medications:</u> Amlodipine 10mgs OD Losartan 12.5mgs OD Paracetamol 1g QDS Naproxen 500mgs BD

Appendix Six

What are the risk factors for AKI?

Situation	85 year old male visits GP with lower abdominal pain and poor urine output.
Background	<p><u>Past medical history:</u></p> <p>Chronic kidney disease Type 2 Diabetes Mellitus (Diet controlled) Benign prostatic hyperplasia (BPH)</p>
Assessment	<p>Observations: BP 130/76, HR 82, RR 18, SpO2 97% on room air, Temp 36.7</p> <p><u>Medications:</u> Finasteride 5mgs OM</p>

Appendix Seven

What are the risk factors for AKI?

Situation	19 year old female admitted with acute confusion.
Background	<p><u>Past medical history:</u></p> <p>Learning difficulties</p>
Assessment	<p>Observations: BP 80/40, HR 135, RR 23, SpO2 95% on room air, Temp 35.3</p> <p><u>Medications:</u></p> <p>Nil</p>

Appendix Eight

What are the risk factors for AKI?

Situation	72 year old male admitted with history of diarrhoea and vomiting for 5 days.
Background	<p><u>Past medical history:</u></p> <p>Hypertension</p>
Assessment	<p>Observations: BP 90/40, HR 120 RR 20, SpO2 95% on room air, Temp 36.9</p> <p><u>Medications:</u></p> <p>Ramipril 10mgs OD</p>

Appendix Nine

What are the risk factors for AKI?

<p>Situation</p>	<p>81 year old female admitted with shortness of breath and chest pain. Diagnosed with worsening heart failure, pulmonary oedema and possible pneumonia. Had CT pulmonary angiography to rule out Pulmonary Embolism (PE).</p>
<p>Background</p>	<p><u>Past medical history:</u></p> <p>Hypertension Ischaemic heart disease T2 Diabetes Mellitus Hysterectomy</p>
<p>Assessment</p>	<p>Observations: BP 102/74, HR 74, RR 21, SpO2 96% on 1L O2, Temp 36.5, CBG 8.3</p> <p><u>Medications:</u></p> <p>Ramipril 10mgs OD Metformin 1g BD Furosemide 40mg BD</p>

Appendix ten

Risk Factors for AKI

- chronic kidney disease
- heart failure
- liver disease
- diabetes
- history of acute kidney injury
- oliguria (urine output less than 0.5 ml/kg/hour)
- Hypovolaemia
- Sepsis
- deteriorating early warning scores
- Medications (NSAIDs, angiotensin-converting enzyme [ACE] inhibitors, angiotensin II receptor antagonists [ARBs] and diuretics)
- Iodinated contrast agents
- symptoms or history of urological obstruction, or conditions that may lead to obstruction
- Age 65 years or over