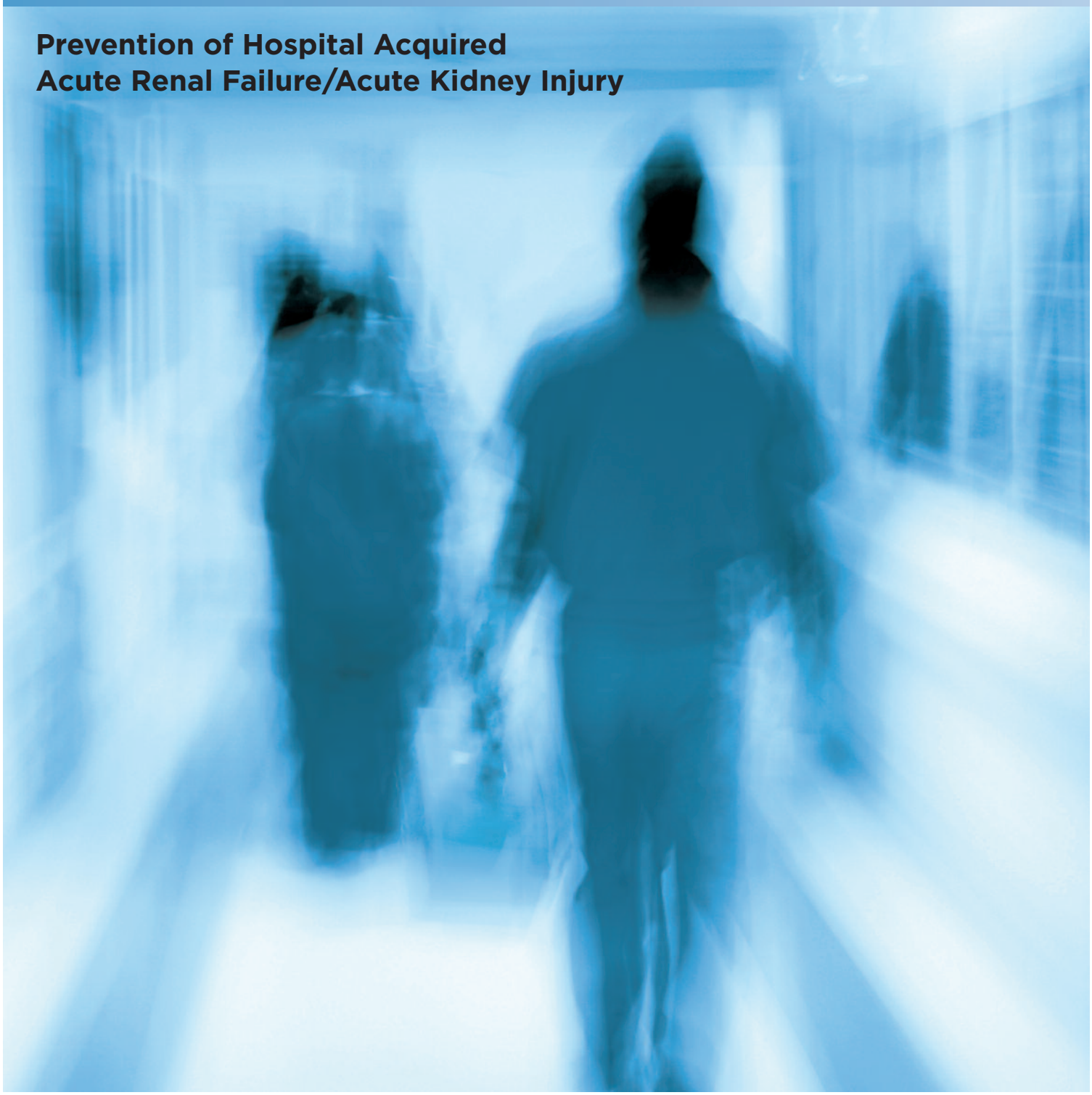
HOSPITAL ACQUIRED ACUTE RENAL FAILURE/ACUTE KIDNEY INJURY CHANGE PACKAGE

Prevention of Hospital Acquired Acute Renal Failure/Acute Kidney Injury



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HRET
HEALTH RESEARCH & EDUCATIONAL TRUST
In Partnership with AHA

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The AHA/HRET HEN would like to acknowledge our partner, Cynosure Health, for their work in developing the Hospital Acquired Acute Renal Failure/Acute Kidney Injury Change Package.

OVERVIEW

Background

- Acute Renal Failure (ARF) is now referred to as Acute Kidney Injury (AKI). It is predominately hospital-acquired.
- Acute Kidney Injury (AKI) includes the entire spectrum of the syndrome, from minor changes in renal function to severe renal dysfunction requiring replacement therapy.
- ARF/AKI occurs in 22%-67% of critically ill patients and is positively correlated with increased mortality, morbidity, and health care costs.
- Mortality from ARF/AKI ranges from 25-80%, with the elderly having the highest mortality.
- The high mortality rate of patients with ARF/AKI cannot be attributed solely to the co-morbid conditions of these patients. AKI is now acknowledged as an independent risk factor for mortality (www.renal.org/guidelines)
- AKI incidence is increasing. In 2012, non-ICU-acquired AKI resulted in up to 20% of hospital admissions, and ICU-acquired AKI was diagnosed in up to 60% of ICU patients.[i]

Suggested AIM:

- Decrease mortality from hospital-acquired ARF/AKI by 40% by December 8, 2014.

Potential Measures:

Outcome: The percentage of patients who die from hospital-acquired ARF/AKI (EOM: OPT-HEN-ARF-24)

Decrease the contrast induced nephropathy (CIN) rate by 40% in the next 12 months (EOM: OPT-HEN-ARF-22)

Process: Percentage of patients who are identified as at risk for CIN and receive pre-procedure volume assessment, appropriate volume expansion, have appropriate adjustments to medications made (EOM: OPT-HEN-ARF-23)

KEY ELEMENTS	IDEAS TO TEST
Prevent Acute Kidney Injury/Acute Renal Failure	• Implement a standardized ARF/AKI risk assessment tool with risk-driven interventions. • Promote consultations with specialists and/or pharmacists for patients who are identified as at risk for AKI. • To decrease the risk of renal injury, implement a standard protocol for patients who are at risk for AKI prior to performing studies requiring nephrotoxic contrast material; include implementation of pre- and post-procedure isotonic hydration, utilization of lower osmolar contrast agents and lower doses of agents, and N-Acetylcysteine administration. • Promote adequate hydration of patients at risk for renal injury: e.g. the elderly, patients with diabetes mellitus and increased creatinine levels, patients admitted with infections, patients with a history of cardiac or vascular surgery.
Minimize the Impact of Acute Kidney Injury	• If renal injury is identified in a patient, ensure he or she has adequate hydration and renal perfusion. • In patients at high risk for ARF/AKI, utilize isotonic hydration and iso-osmolar, non-ionic contrast agents for imaging studies. • To promote consistent treatment of contrast nephropathy, develop an order set which includes hydration and N-Acetylcysteine administration. • Standardize referrals to specialists and pharmacists to minimize the risks of further renal injury. • Consider "hard stops" for non-steroidal anti-inflammatory medications for patients who have AKI during their hospital stay.
Provide Support and Follow-up for Patients with AKI	• If AKI has been diagnosed, initiate renal replacement therapy (RRT). • Monitor patients who exhibit renal recovery (i.e. no need for dialysis at hospital discharge) for the subsequent development of chronic renal failure, congestive heart failure, and increased readmission risk. • Avoid peripherally inserted central lines in an effort to preserve the vasculature in the upper limbs for potential hemodialysis shunt placement. • Develop a system to seamlessly transition patients who require hemodialysis post-discharge to outpatient dialysis units/centers.

Making Changes:

- This intervention addresses a LEAPT (Leading Edge Advanced Practice Topics) focus and includes webinars, change packages, and other tools.

Key Resources:

- The SCCM website and journals
- www.choosingwisely.org
- Website: http:/www.sccm.org AND http://www.sccm.org/Search/results.aspx?k=AKI&cs=This%20Site&u=http%3A%2F%2Fwww.sccm.org%2FCommunications
- The American Society of Nephrology
- Severe Sepsis and Septic Shock Change Package
- Website: www.Renal.org

HOSPITAL ACQUIRED ACUTE RENAL FAILURE/ACUTE KIDNEY INJURY DRIVER DIAGRAM

AIM: Decrease mortality related to hospital-acquired ARF/AKI by 40% by December 8, 2014

PRIMARY DRIVERS	SECONDARY DRIVERS	CHANGE IDEAS
Prevention of Acute Kidney Injury/ Acute Renal Failure	• Implement a standard ARF/AKI risk assessment to identify at-risk patients who could benefit from appropriate intervention.	• Implement a standard ARF/AKI risk assessment tool with risk-driven interventions. • Consider using the Risk Injury Failure Loss ESRD (RIFLE) classification for AKI to standardize diagnoses and promote consensus for actions. • Promote consultation with nephrologists and/or pharmacists for patients who are identified as being at risk for AKI. • Provide an electronic alert via the EMR to doctors, nurses, and pharmacists in case of an elevated creatinine. • Avoid iatrogenic hypotension by appropriately prescribing and adjusting medications such as ACE Inhibitors and diuretics. • To decrease the risk of renal injury, implement a standard protocol for patients who are at risk for AKI prior to performing studies requiring nephrotoxic contrast material; include implementation of pre- and post-procedure isotonic hydration, utilization of lower osmolar contrast agents and lower doses of agents, and N-Acetylcysteine administration. • Partner with the pharmacy to develop guidelines for the prescription and use of medications that can be nephrotoxic, and for the adjustment of drug dosages in case of renal insufficiency. • Promote adequate hydration of patients at risk for renal injury: e.g. the elderly, patients with Diabetes Mellitus and increased Creatinine levels, patients admitted with infections, patients with a history of cardiac or vascular surgery. • Implement reliable and consistent screening for and treatment of severe sepsis and septic shock.
Minimize the Impact of Acute Kidney Injury	• If renal injury is identified, ensure adequate hydration and renal perfusion in the patient.	• If renal injury is identified in a patient, ensure he or she has adequate hydration and renal perfusion. • In patients at high risk for ARF/AKI, utilize isotonic hydration and iso-osmolar, non-ionic contrast agents for imaging studies. • To promote consistent treatment of contrast nephropathy, develop an order set which includes hydration and N-Acetylcysteine administration. • Standardize referrals to specialists and pharmacists to minimize the risks of further renal injury. • Consider "hard stops" for non-steroidal anti-inflammatory medications for patients who have AKI during their hospital stay.
Provide Support and Follow-up for Patients with AKI	• Develop standards for appropriate support and follow-up for patients who developed or were diagnosed with AKI during their hospitalization.	• If AKI has been diagnosed, initiate renal replacement therapy (RRT). • Monitor patients who exhibit renal recovery (i.e. no need for dialysis at hospital discharge) for the subsequent development of chronic renal failure, congestive heart failure, and increased readmission risk. • Avoid peripherally inserted central lines in an effort to preserve the vasculature in the upper limbs for potential hemodialysis shunt placement • Develop a system to seamlessly transition patients who require hemodialysis post-discharge to outpatient dialysis units/centers.

Key Resources:

- SCCM website and journals
- The American Society of Nephrology
- Website: http:/www.sccm.org AND http://www.sccm.org/Search/results.aspx?k=AKI&cs=This%20Site&u=http%3A%2F%2Fwww.sccm.org%2FCommunications
- Severe Sepsis and Septic Shock Change Package
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HOSPITAL ACQUIRED ACUTE RENAL FAILURE/ ACUTE KIDNEY INJURY

Background

- Acute Renal Failure (ARF) is now referred to as Acute Kidney Injury (AKI). It is predominately hospital-acquired.
- Acute Kidney Injury (AKI) includes the entire spectrum of the syndrome, from minor changes in renal function to severe renal dysfunction requiring replacement therapy.
- ARF/AKI occurs in 22%-67% of critically ill patients and is positively correlated with increased mortality, morbidity and health care costs.
- Mortality from ARF/AKI ranges from 25-80% with the elderly having the highest mortality.
- The high mortality rate of patients with ARF/ AKI cannot be attributed to the co-morbid conditions of these patients.
- AKI incidence is increasing. In 2012, non-ICU-acquired AKI resulted in up to 20% of hospital admissions, and ICU-acquired AKI was diagnosed in up to 60% of ICU patients.

AKI is diagnosed if one of the following criteria is met:

- Serum creatinine rises by) 26µmol/L within 48 hours or
- Serum creatinine rises) 1.5-fold from the known reference value or
- Urine output is < 0.5ml/kg/hr for >6 consecutive hours or
- Kidney injury which is presumed to have occurred within one week.

Agreement on standard definitions and classifications is key in effectively identifying and treating AKI/ARF. The RIFLE definition and staging system for AKI are the gold standards for this area.[1]

AKI staging classification

STAGE	SERUM CREATININE (SCR) CRITERIA	URINE OUTPUT CRITERIA
1	An SCr increase ≥ 26 µmol/L within 48 hrs or an SCr increase ≥ 1.5 to 1.9 X the reference SCr	<0.5 mL/kg/hr for > 6 consecutive hrs
2	An SCr increase ≥ 2 to 2.9 X the reference SCr	<0.5 mL/kg/ hr for > 12 hrs
3	An SCr increase ≥3 X the reference SCr, an SCr increase 354 µmol/L, or placement of the patient on renal replacement therapy (RRT) irrespective of the AKI stage	<0.3 mL/kg/ hr for > 24 hrs or anuria for 12 hrs

RIFLE Grading System

	GFR CRITERIA	URINE OUTPUT CRITERIA	
R – Risk	SCr increased 1.5 times	<0.5mL/kg/h for 6 h	High-Sensitivity
I – Injury	SCr increased 2.0 times	<0.5mL/h for 12 h	
F – Failure	SCr increased 3.0 times	<0.3mL/kg/h for 24 h or anuria for 12h	High Specificity Earliest point for RRT
L – Loss of Function	Persistent ARF; complete loss of kidney function for longer than 4 wks.		
E – End Stage Renal Disease	ESRD persisting longer than 3 mos.		

Suggested AIM

The first step towards reducing the rates of hospital-acquired Acute Renal Failure/ Acute Kidney Injury is to make a strong commitment to improve procedures which includes a solid aim.

E.g. AIM statement: Decrease mortality from hospital-acquired ARF/AKI by 40% by December 8th, 2014.

PREVENTION OF ACUTE KIDNEY INJURY AND ACUTE RENAL FAILURE

The new terminology of AKI enables healthcare professionals to view the condition more accurately as a spectrum of injury. This spectrum extends from less severe forms of injury to more advanced injury in which acute kidney failure may require renal replacement therapy (RRT). Clinically, AKI is characterized by a rapid reduction in kidney function, resulting in a failure to maintain fluid, electrolyte, and acid-base homoeostasis. Common definitions and classifications are key for the effective identification and treatment of AKI/ARF.[2]

Suggested Process Measures

- Compliance with standards for risk assessment for AKI and classification of AKI severity.
- Compliance with prevention strategies in patients identified at risk for AKI.
- Percent of patients with AKI appropriately classified: Percentage of at-risk AKI patients appropriately identified.

Secondary Driver: Implement a standard ARF/AKI risk assessment tool for all patients which suggests risk-driven interventions for prevention and treatment.

Understanding the risk factors in the development of AKI and implementing screening for AKI are the first steps in preventing this condition. Modifiable risk factors that are identified should be mitigated. Renal services can work together with other specialties to develop clear guidelines for the management of AKI, which should include recommendations for when to request a nephrology evaluation or referral.

Risk factors for developing AKI include:

- Age > 75 yrs
- Chronic kidney disease (CKD), (eGFR < 60 mL/min/1.73m^2)
- Cardiac failure
- Atherosclerotic peripheral vascular disease
- Liver disease
- Diabetes mellitus
- Nephrotoxic medication
- Hypovolemia
- Sepsis

Change Ideas

- Implement a standardized ARF/AKI risk assessment tool which suggests risk-dependent interventions.
- Consider using the Risk Injury Failure Loss ESRD (RIFLE) classification to standardize AKI diagnoses and promote consensus for actions.
- Encourage consultations with specialists and/or pharmacists for patients who are identified as being at risk for AKI.
- Send a notification via the electronic practice management system/medical record to relevant staff (e.g. nurses, pharmacists) in cases of elevated Cr.
- Avoid iatrogenic hypotension by appropriately adjusting prescribed ACE Inhibitors and diuretics.
- To decrease the risk of kidney injury, implement a standard protocol for patients who are at risk for AKI prior to performing studies requiring nephrotoxic contrast. They protocol may include providing pre- and post-procedure isotonic hydration, using a lower osmolar contrast agent, prescribing lower agent doses, and administering N-Acetylcysteine.
- Collaborate with pharmacy partners to develop guidelines for the use of potentially nephrotoxic drugs and medications that include instructions for adjusting doses based on renal function.
- Promote adequate hydration of patients at risk for renal injury: e.g. the elderly, patients with DM and increased creatinine, patients admitted with infections, or patients with a history of cardiac or vascular surgery.
- Implement reliable and consistent screening for and treatment of severe sepsis and septic shock.

MINIMIZE THE IMPACT OF ACUTE KIDNEY INJURY

Prescribing inappropriate doses of medication in patients with AKI increases the risk of adverse drug events. Pharmacokinetics, including the volume of drug distribution, drug clearance, and protein binding, can be altered by organ failure in critically ill patients. To reduce the risk of toxicity, physicians must accurately assess kidney function and adjust drug doses appropriately. There is an important role for clinical pharmacists who can assist providers with these challenging assessments and calculations; renal services should consult with and collaborate with other specialties to develop guidelines for the management of AKI. These guidelines should also include recommendations for when a nephrology referral should be requested.

Suggested Process Measures

The proportion of patients at high risk of contrast-induced AKI (CI-AKI) who developed AKI and did NOT

- Receive pre-procedure volume assessment.
- Receive appropriate volume expansion.
- Have appropriate adjustments to medications made.

Secondary Driver: To prevent further escalation of AKI, ensure adequate hydration and renal perfusion if renal injury is identified

Prescription of intravenous fluids should follow a careful assessment of patient volume status, i.e. is the patient hypovolemic, euvolemic, or hypervolemic. If the patient is hypovolemic, the nature of the fluid loss should be determined, so as to guide the amount and type of fluids that need to be replaced. To prevent escalation of renal injury, N-acetylcysteine (Mucomyst) (or another alkalizing agent which acts as a scavenger of free radicals), an antioxidant, and a vasodilator should be administered.[3]

Diagnostic criteria for contrast-induced nephropathy (CIN) include:

- An increase in SCr of 0.5mg/dl or an SCr 25% greater than baseline.
- An increase in SCr levels occurring 48-72 hours after the administration of a contrast agent, and persisting for 2-5 days.
- The exclusion of other etiologies of nephropathy.

Change Ideas

- Develop an order set to promote consistency in the treatment of contrast nephropathy, which includes hydration and N-acetylcysteine administration.
- Standardize procedures for consultations and referrals to nephrology and pharmacy to minimize the risk of further renal injury.
- Consider "hard stops" for non-steroidal anti-inflammatory medications for patients who have AKI during their hospital stay.

SUPPORT AND FOLLOW-UP FOR PATIENTS WITH AKI

Suggested process measures

- The proportion of AKI survivors who are given information on the causes of AKI, and how AKI might be avoided in the future.

Secondary Driver: Develop procedures to support and follow up patients who developed AKI during their hospitalization

Renal replacement therapy should be started as soon as AKI is confirmed, and the modality of therapy should be guided by the patient's clinical status, the availability of treatment options, and the expertise of the clinical staff and consultants. The burden of Chronic Kidney Disease (CKD) in survivors of AKI, as well as the number of patients who progress to ESRD may be underestimated and underappreciated. Planning for long-term management is critical for the provision of effective and ongoing post-discharge care. Post-discharge follow-up for survivors of AKI, which addresses the appropriate management of residual renal function, is necessary to improve quality of life and decrease the risk of hospital readmission.[4]

Change Ideas

- Initiate renal replacement therapy (RRT) as soon as AKI is diagnosed.
- Develop a method to monitor and follow up patients with renal recovery (i.e. who are not on dialysis at discharge) for the development of chronic renal failure and the subsequent increased risk for readmission.
- Avoid peripherally inserted central lines in an effort to preserve the vasculature in the upper limbs for potential hemodialysis shunt placement
- Develop a system for seamlessly transitioning patients who require hemodialysis post-discharge to an outpatient dialysis center.

POTENTIAL BARRIERS

Education about ARF/AKI will be critical for all members of the health care team, i.e. physicians, ED and inpatient nurses, specialists, pharmacists, and radiology staff who will be responsible for the care of these patients. Consider establishing educational sessions that focus on key concepts such as early identification of patients at risk, as well as on procedures for implementing appropriate treatment and referrals.

Recognize that some physicians may perceive these new procedures and educational sessions as unnecessary or intrusive, especially if they are being asked to change their care delivery practices or refer patients to specialists earlier in the disease course.[5, 6]

To promote buy-in, engage key stakeholders such as physicians, nephrologists, pharmacists, bedside nurses, and dialysis nurses as leaders on improvement teams to collaborate in the development of screening tools and risk assessments.

Advise the physicians about the proven value of enhancing an entire team's knowledge and expertise in reducing errors. Understanding the benefits of expanding team skills can mitigate physician resistance and increase adoption of new approaches to AKI care.

Select several physician champions to speak to the team about acute kidney injury, and invite representatives from administration, medicine, nursing, dialysis, and pharmacy to participate in the AKI program. This visible commitment by a broad swath of the organization's leaders and professionals will provide early momentum, and help to drive improvement efforts forward.

Use administrative leadership and sponsorship to help remove or mitigate barriers

To ensure that these aims are aligned with the organization's strategic goals, each institution should invite senior leaders to become involved in developing and publicly embracing the AKI goals and specific objectives. When senior leaders approve the aims, they should also commit to supporting the implementation team with the resources necessary to achieve the designated goals. An executive sponsor can also help to communicate the program's vision, i.e. the "big picture" to the organization, its employees, and its clients. Finally, executive leadership can remove or mitigate obstacles or barriers that may arise as improvement strategies are implemented.

A respected physician champion, selected from the department adopting a change process, can play a crucial role in promoting acceptance and implementation of new procedures and changes in practice. By disseminating the planned changes in the context of continuous quality improvement to benefit patients, senior leaders from all departments involved (e.g. medicine, nursing, pharmacy, radiology, nephrology) can promote the successful adoption of new ideas and change processes.

This change in practice may also require a change in culture for your organization.

To achieve improvement goals, everyone involved with the care of patients along the spectrum of AKI should be enlisted to contribute. Work processes must be carefully scripted and standardized, and individual awareness and commitment to this effort must extend from the C-suite to the ICU. AKI prevention must become a team effort that crosses disciplines and departments; successful outcomes require dynamic leadership, buy-in from all stakeholders caring for vulnerable patients, and engagement by the entire organization.

There are three different levels of participation in the creation of successful change:

1. The active working team responsible for daily planning, documentation, communication, education, monitoring, and evaluation of the change activities.

The working team **must** be multidisciplinary, with representation from all relevant departments involved in the change processes, e.g. doctors, nurses, pharmacists, and radiologic technicians. Team members should be clear about the specific aim for ARF/AKI reduction, and knowledgeable regarding the associated literature, the current local work processes, the changes to be implemented, and any environmental concerns that will be impacted by these changes.

2. The leadership group or individual who helps to remove barriers, provide resources, monitor overall progress, and give suggestions from an institutional perspective.

The implementation team benefits from the involvement of a leader with authority in the organization to overcome barriers that may arise, and who can allocate the resources the team needs to achieve its goals. An effective leader should understand the implications of the proposed changes throughout the system, and be able to anticipate and address any unintended consequences of the change process.

3. Providers, including all stakeholders who have an interest in the change, must also be engaged.

Effective communication procedures are needed to keep providers and other stakeholders informed, and to receive and welcome feedback. Stakeholders must be encouraged to contribute their input, and must feel confident that their contributions will be respected and will influence the change process. Such reassurance builds stakeholder ownership and facilitates implementation and utilization of the new processes and workflows.

TIPS ON THE USE OF THE MODEL FOR IMPROVEMENT

Implement the ARF/AKI ideas one at a time:

Step One: Plan

1. Begin by identifying and screening patients at risk for AKI as early as possible.
2. Choose a screening tool for patients at risk for ARF/AKI, and develop a protocol for its use.

Step Two: Do

1. Ask a receptive, early-adopter physician on your improvement team to trial/test these tools with the next few patients in his or her department.
2. Ask a receptive nurse to test the screening tool as well.
3. Test "small": i.e. coordinate with the physician-champion to trial the screening on one patient, in one unit, with one nurse.

Step Three: Study

1. Debrief as soon as possible after the test with those involved, asking:
   a. What happened?
   b. What went well?
   c. What didn't go well?
   d. What do we need to revise for next time?

Step Four: Act

1. Do not wait for "the next meeting" to make changes. Revise your test procedures and re-test as soon as possible with the same physician and the same nurse.
2. If a test is successful, disseminate the test to other clinicians and units and mentor trials in those units.

Acute Kidney Injury

WARNING SIGNS

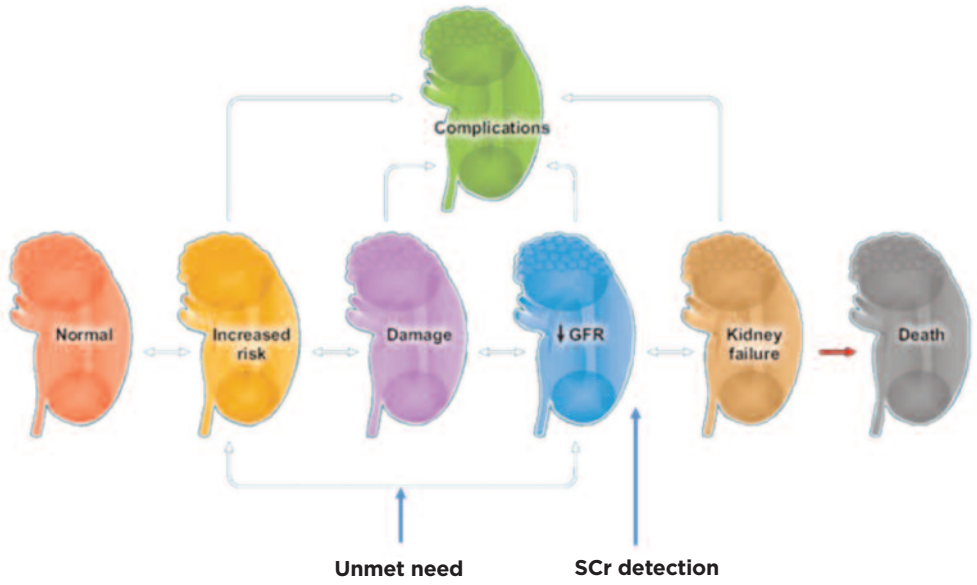
- Rise in Cr by 26μmol/l
- Urine output < 500ml in 24h
- Systolic BP < 90mmHg

ACTION

- **A**ddress medications
- **B**oost blood pressure
- **C**alculate fluid balance
- **D**ip Urine
- **E**xclude obstruction

Appendix II: Pictorial of AKI

Spectrum of Kidney Injury



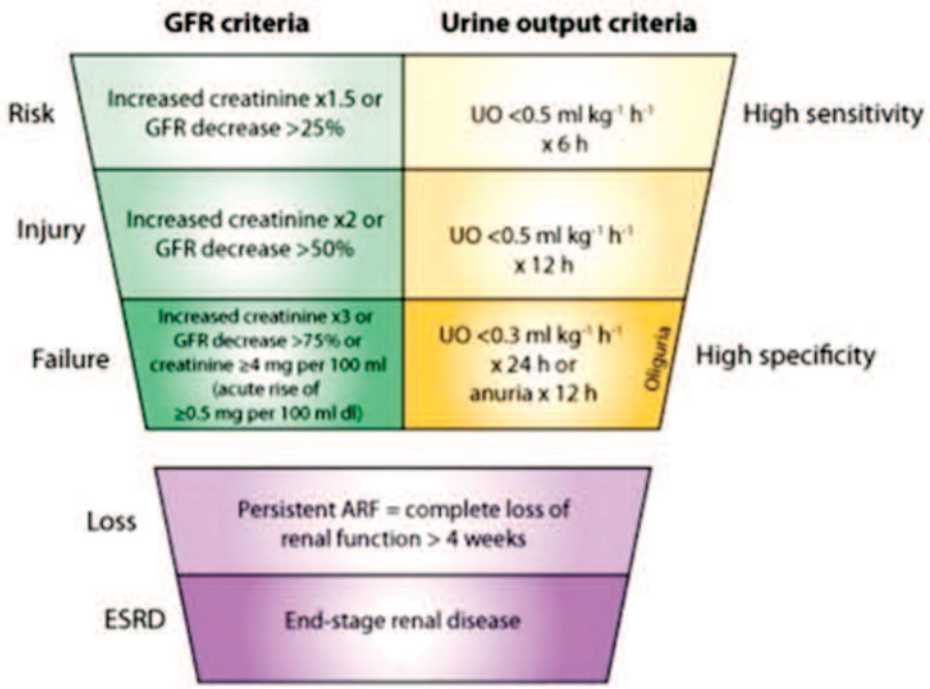
Vaidya, et al. *Ann Rev Pharmacol Toxicol*. 2008; 48:463-493.

Spectrum of Kidney Injury

Biomarkers need to detect AKI at an earlier time point than the typically delayed rise in serum creatinine so that a rapid diagnosis can be made and interventions can be applied in a timely manner. A reduction in the GFR causes an increase in serum creatinine. The increase in serum creatinine occurs after possible kidney injury has already occurred. Creatinine is not an ideal biomarker for diagnosing AKI because it is a marker of GFR not kidney injury. There can be up to a 48 hour delay after kidney injury occurs before serum creatinine level rises and during this delay, damage to the kidney has already occurred. This delay in diagnosis prevents timely treatment of the patient suffering with AKI.

Appendix III: RIFLE CRITERIA

RIFLE Criteria



Appendix IV: ARF/AKI Top Ten Checklist

Acute Renal Failure/Acute Kidney Injury Top Ten Checklist

TOP TEN EVIDENCE BASED INTERVENTIONS				
PROCESS CHANGE	**IN PLACE**	**NOT DONE**	**WILL ADOPT**	**NOTES (RESPONSIBLE AND BY WHEN?)**
Implement a standardized ARF/AKI risk assessment tool with risk-driven interventions.	☐	☐	☐	
Consider using the Risk Injury Failure Loss ESRD (RIFLE) classification for AKI to standardize diagnoses and create consensus for action.	☐	☐	☐	
Ensure consultations with a specialist and/or the pharmacists for patients who are identified as being at risk for AKI.	☐	☐	☐	
To decrease the risk of injury, implement a standard protocol for patients who are at risk for AKI prior to performing studies requiring nephrotoxic contrast; use pre & post procedure isotonic hydration, lower osmolar contrast agent, lower doses of contrast, N-Acetylcysteine administration.	☐	☐	☐	
Establish guidelines with pharmacy partners for nephrotoxic drugs and medications that require adjustments for renal insufficiency.	☐	☐	☐	
Promote adequate hydration of patients at risk for renal injury: e.g. the elderly, patients with DM and increased Cr., patients admitted with infections, patients with a history of cardiac or vascular surgery.	☐	☐	☐	
Develop patient and family education and tracking system for patients who are identified as “at risk” for AKI or who developed AKI during hospitalization to promote outpatient monitoring and identification for subsequent admissions	☐	☐	☐	
Establish a system to ensure renal replacement therapy (RRT) after AKI is diagnosed.	☐	☐	☐	
Develop and implement a protocol to follow up patients who exhibit renal recovery (i.e. are not on dialysis at discharge) for the development of chronic renal failure and an increased risk of readmission.	☐	☐	☐	
Develop a system for seamlessly transitioning patients who require hemodialysis post-discharge to an outpatient center/facility.	☐	☐	☐	

Additional resources, such as the driver diagram and change package, can be found at www.HRET-HEN.org

Key Resources:

- SCCM website and journals, http:/www.sccm.org http://www.sccm.org/Search/results.aspx?k=AKI&cs=This%20Site&u=http%3A%2F%2Fwww.sccm.org%2FCommunications
- The American Society of Nephrology
- Severe Sepsis and Septic Shock Change Package
- Website: www.renal.org

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