

SUPPORT AKI

Strategy for UPtake of PrOcesses for Recognizing and Responding To Acute Kidney Injury

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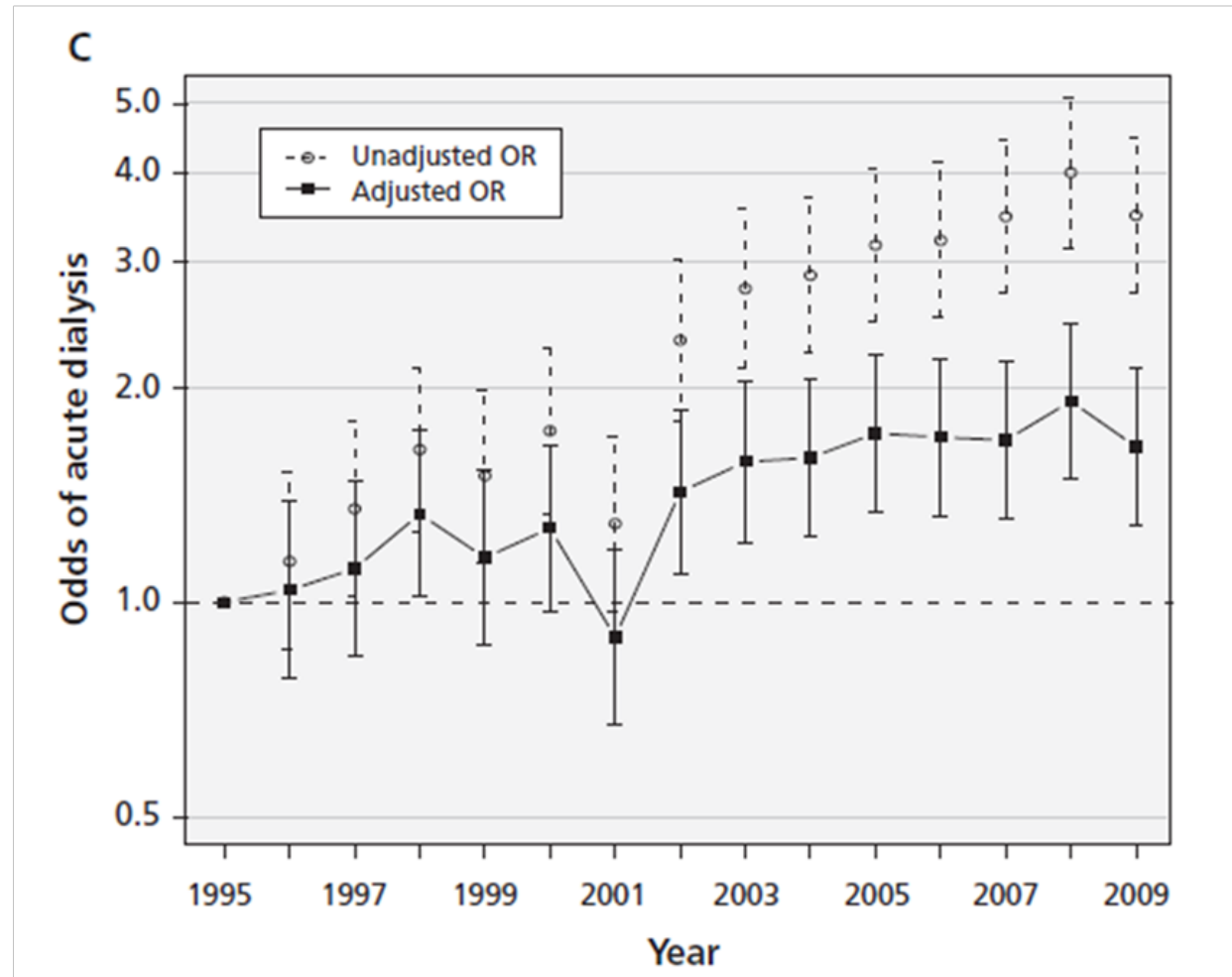


Overview: Why, What & How?

- **Why** is it important to recognize and manage AKI early?
- **What** will be done as part of the initiative?
- **How** will it be implemented?
- Questions and next steps

Why?: Rising Incidence of Acute Dialysis

N Siddiqui, SG Coca, PJ Devereux, AK Jain, L Li, J Luo, CR Parikh, M Paterson,
HT Philbrook, R Wald, M Walsh, AX Garg
CMAJ 2012



Why?: AKI, hospitalization, and costs in Alberta

Methods



Alberta

Nov, 2002 to April, 2009
239,906 hospitalized adults



baseline Cr determined prior to admission



AKI:
AKIN-determined by peak Cr



Recovery:
determined by Cr after D/C

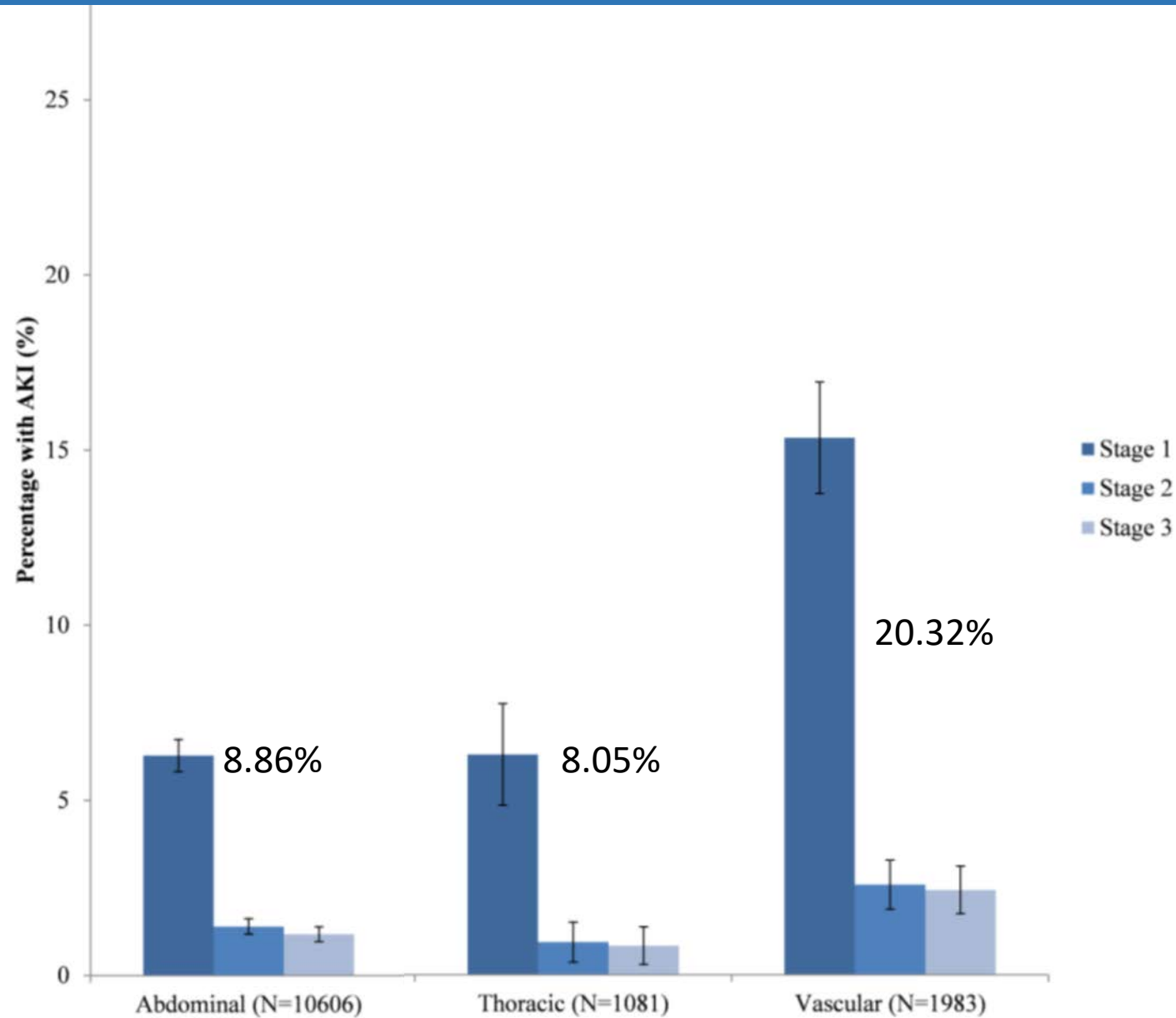
Results

		N	hospital mortality	one year mortality	length of stay	hospital cost
	No AKI	206,650 (86%)	3%	12%	8.9 days	\$9,444 CAD
↕	Stage 1	25,495 (11%)	12%	25%	11.4 days	\$12,356 CAD
	Stage 2	4,598 (2%)	27%	41%	12.8 days	\$14,370 CAD
↕	Stage 3	2,493 (1%)	34%	47%	13.7 days	\$14,822 CAD
	Stage 3 + Dialysis	670 (0.3%)	50%	56%	16.5 days	\$24,260 CAD

Conclusion Severity of AKI, need for dialysis, and lack of kidney recovery are associated with significant health care costs in hospitalized patients and persist a year following admission.

David Collister, Neesh Pannu, Feng Ye, Matthew James, Brenda Hemmelgarn, Betty Chui, Braden Manns, Scott Klarenbach. Healthcare Costs Associated with Acute Kidney Injury, CJASN doi:10.2215/CJN.00950117.

Why?: AKI After Major Surgery in Calgary



Why?: The Clinical Challenge

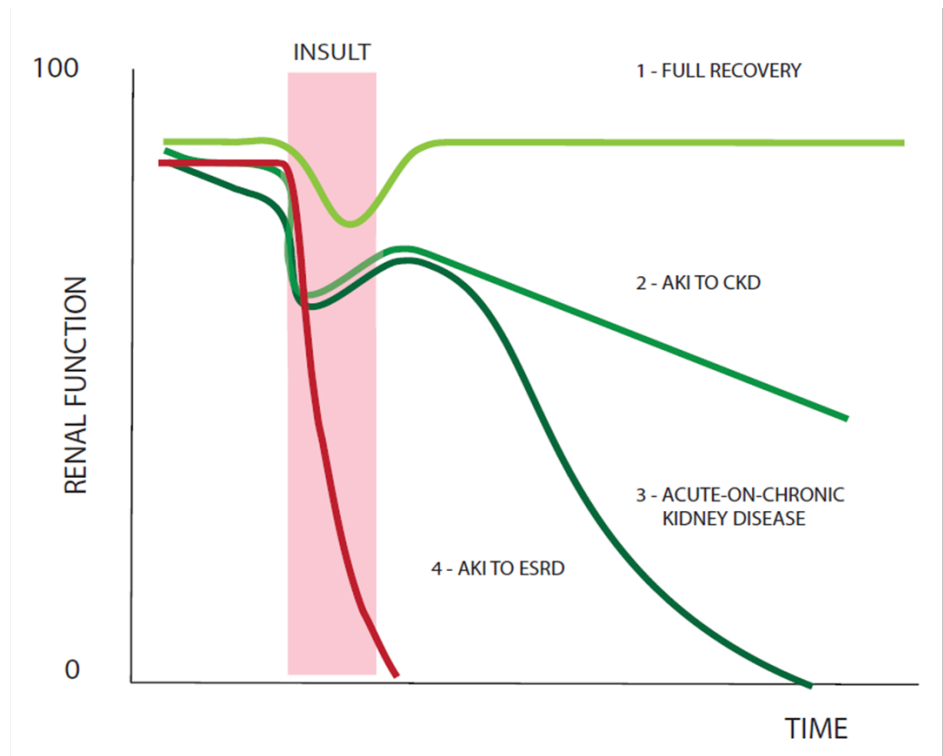
Early intervention begins with early recognition

- Symptoms absent at early stage
- Scr changes indicating AKI occur in ~40% before SCr “abN”
- Possible warning sign (not always): reduced urine production
- Fluid balance and medication effects are modifiable:
Reduced intake, vomiting, edema, low/high blood pressure,
NSAIDs

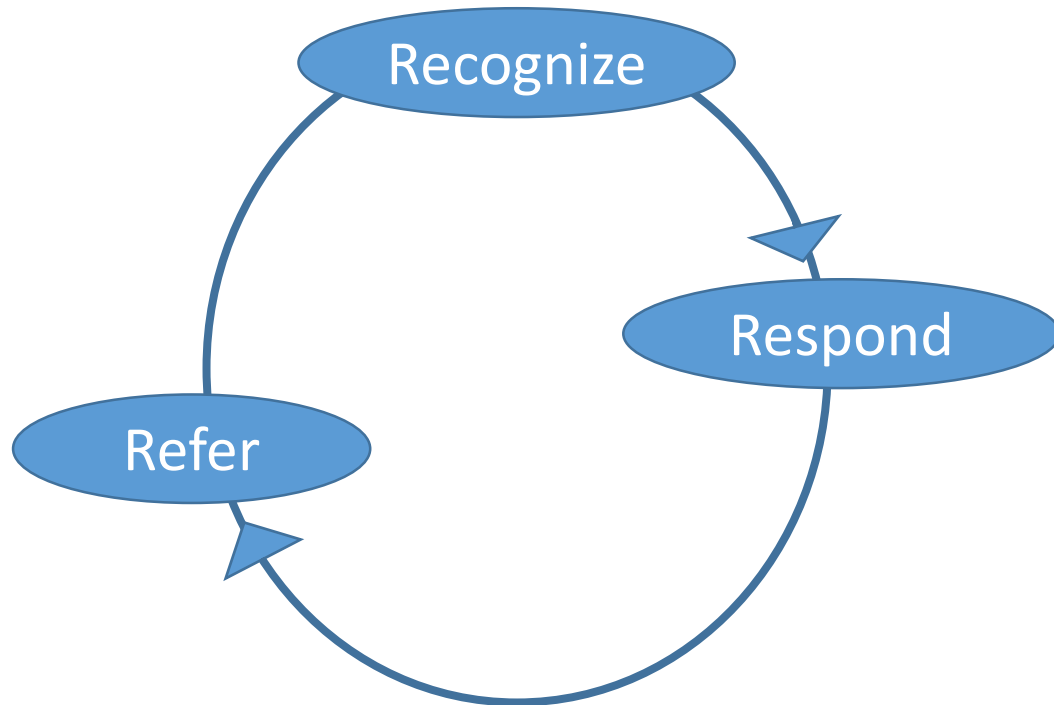
Renal function can continue to decline, unless AKI is recognized and treated

Why?: Health Impact on Patients

- Adverse outcomes include **need for dialysis, chronic kidney disease and end-stage renal disease, mortality**¹
- **8.8 times greater risk of developing chronic kidney disease** in patients who develop in-hospital AKI²
- **12.6 times greater risk of mortality** in perioperative patients with AKI³



What?: The SUPPORT AKI Initiative



Recognize

- Recognize AKI at its onset and factors contributing to progression

Respond

- Early use of IV fluid therapies, medication management, and appropriate monitoring

Refer

- Resources to guide care and referral when needed

Outcome: Reverse injury, Reduce avoidable harm, Restore renal function

What?: The SUPPORT AKI Initiative

James et al. *Canadian Journal of Kidney Health and Disease* 2014, **1**:20
<http://www.cjkhd.org/content/1/1/20>



CANADIAN JOURNAL OF
KIDNEY HEALTH AND DISEASE
Journal Canadien de la Santé et de la Maladie Rénale

REVIEW

Open Access

Improving prevention, early recognition and management of acute kidney injury after major surgery: results of a planning meeting with multidisciplinary stakeholders

Matthew T James^{1,2,6*}, Elijah Dixon^{2,3}, Derek J Roberts^{2,3}, Rebecca Barry¹, Carlee Balint¹, Aleem Bharwani¹, William Don Buie³, Tomas Godinez⁴, Brenda R Hemmelgarn^{1,2}, John B Kortbeek³, Braden J Manns^{1,2}, Andria Marin³, Nairne Scott-Douglas¹, Henry Tom Stelfox^{2,4} and Neesh Pannu⁵

Intravenous Therapies for Hypovolemic Patients

- ✓ Isotonic crystalloids (0.9% NaCl or Ringer's Lactate) are preferred for initial management for expansion of intravascular volume
- ✓ Diuretics are not recommended to treat AKI, except in the management of volume overload.
- ✓ Boluses of intravenous fluids are considered the most effective strategy for correcting hypovolemia.
 - Review volume administration safety concerns, determine risk for volume overload, & select bolus volumes
 - Administer repeat boluses as needed unless signs of volume overload/cardio-respiratory compromise are present

Medication Management

- ✓ Consider **stopping flagged medications that** affect kidney function
- ✓ Consider adjusting doses for **renally cleared drugs** for cases of persistent severe AKI (Stage 2 or Stage 3 AKI only)

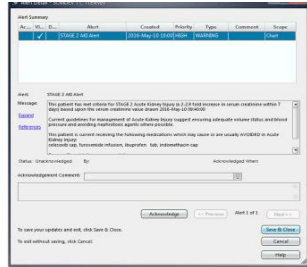
Consult clinical pharmacist if needed

What?: The SUPPORT AKI Initiative



AKI alerts

- Non-interruptive alerts in SCM based on Scr changes to identify patients at first onset of AKI and progression of severity stage



Medication alerts

- Flags medications that may be impacting kidney function or those requiring dose adjustment



AKI Dashboard

- Summarizes information on fluid balance, IV therapies, to guide early intervention.



AKI Order Sets

- Resource to guide the management of AKI and recommendations for consultation with specialists

Recognize

The screenshot shows a software interface for 'My Applications' with 'Acute Care' selected. The 'Actions' menu is open, listing various options for managing visit lists. The 'Select Visit List Column...' option is highlighted in blue, and a red arrow points to it from the 'Patient List' tab area.

My Applications ▶ Acute Care

File Registration View GoT **Actions** Preferences Tools

My Applications

Acute Care ▶

Ambulator... ▶

Emergency... ▶

No patient visit selected

Patient List Orders

Current List: Patient List

Patient Name In

no patient visits.

Provider Family MD New

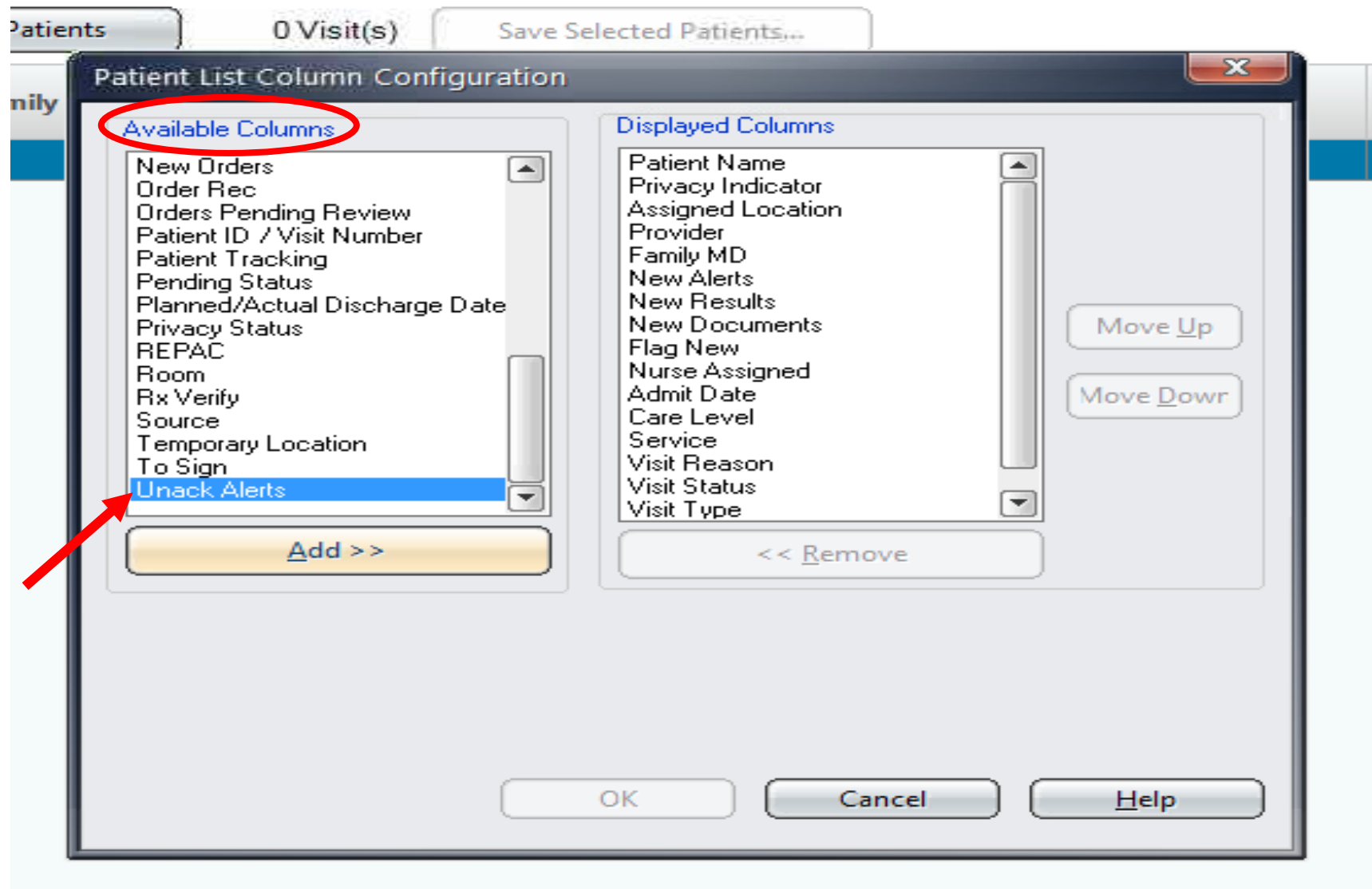
PCIS ON LINKS CALL

Documents Flowsheets Clinical Summary

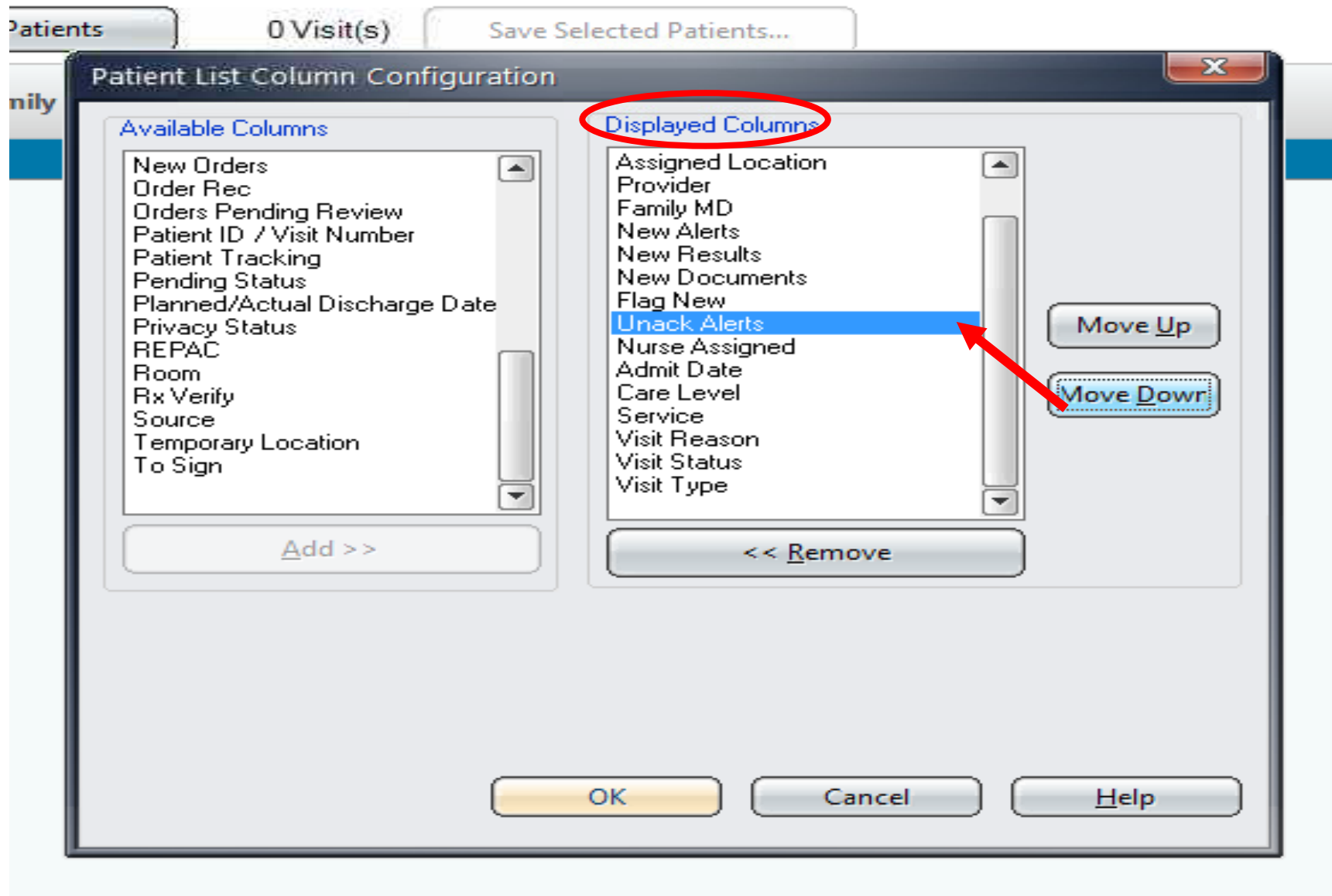
Select All Patients 0 Vi

- New Visit List...
- Modify Visit List...
- Delete Current List
- Delete Visit List...
- Flag New On
- Flag New Off
- Select All Visits
- Save Selected Visits...
- Remove Selected Visits
- Select Visit List Column...**
- Define Sort Order...
- Save Sort Order
- Reset Sort Order
- Current List ▶

Recognize



Recognize



Recognize

Current List:

FMC Acute Consults



Select All Patients

16 Visit(s)

Save Selected Patients...

Patient Name	Privacy Indicator	Assigned Location	Age	Provider	Flag New	New Alerts	Unack Alerts	New Orders	New Res...	New Docu...	To V...	To Sign	ARO/M ...
	Normal											▼	
	Normal											▼	
	Normal											▼	
	Normal											▼	y
	Normal											▼	
	Normal											▼	
	Normal						🚩					▼	
	Normal						🚩					▼	
	Normal											▼	

Recognize: AKI Alerts

Alert Summary

Ac...	Vi...	D...	Alert	Created	Priority	Type	Comment	Scope
	✓		STAGE 1 AKI Alert	2016-May-10 09:53	HIGH	WARNING		Chart

Alert: **STAGE 1 AKI Alert**

Message:

[Expand](#)

[References](#)

This patient has met criteria for STAGE 1 Acute Kidney Injury (= 26 mmol/L increase in serum creatinine within 48 hours or 50% increase within 7 days) based upon the serum creatinine value drawn 2016-May-09 09:40:00

Current guidelines for management of Acute Kidney Injury suggest ensuring adequate volume status and blood pressure and avoiding nephrotoxic agents where possible.

This patient is current receiving the following medications which may cause or are usually avoided in Acute Kidney Injury:

celecoxib cap, furosemide infusion, ibuprofen tab, indomethacin cap

Status: Unacknowledged By: Acknowledged When:

Recognize: Medication Alerts

Alert Summary

Ac...	Vi...	D...	Alert	Created	Priority	Type	Comment	Scope
✓	✓		AKI Alert	2016-May-13 13:10	HIGH	WARNING	test	Chart

Alert: AKI Alert

Message: **ADVERSE DRUG EVENTS WARNING FOR ACUTE KIDNEY INJURY**

[Expand](#) This patient has developed STAGE 1 Acute Kidney Injury within the last 48 hours 2016-May-13 13:07:31

[References](#) This medication may cause worsening kidney function and/or is usually avoided in Acute Kidney Injury:
celecoxib cap, metoLAZONE liquid

Status: Acknowledged By: Ji, Chen Analyst Acknowledged When: 2016-May-13 13:10

Acknowledgement Comment:

test

Recognize: AKI Dashboard

[Patient List](#)
[Orders](#)
[Results](#)
[Patient Info](#)
[Timeline](#)
[Documents](#)
[Flowsheets](#)
[Clinical Summary](#)
[AB Netcare Portal](#)

View: Acute Kidney Injury | 1 week | 2017-Dec-15 15:55 To 2017-Dec-22 15:55

AKI Stage

AKI Stage	Date Onset	Creatinine Level
STAGE 3 AKI Alert	2017-Dec-19 02:31	379

7 Day Creatinine Urea

Date	Creatinine LEVEL	Urea
Dec-17-2017 0:00	266.0	17.2
Dec-18-2017 0:00	275.8	19.0
Dec-18-2017 0:00	351.0	21.5
Dec-19-2017 0:00	364.8	23.6
Dec-19-2017 0:00	379.0	23.2
Dec-20-2017 0:00	333.0	
Dec-21-2017 0:00	293.0	
Dec-22-2017 0:00	259.0	

Health Issues

Health Issue	Onset Date	Description
Admitting Dx		
recurrent diverticulitis	2017-Dec-07	recurrent diverticulitis
Surg Procedure		
2017/12/16-Laparotomy:Recto Sigmoid...	2017-Dec-17	2017/12/16-...
Sign Over		
Dec 22	2017-Dec-08	62 y.o. female IgA...
SignOverConsit1		
Dec 16 - Stable	2017-Dec-13	62yo female with a previous...
Past History		
Stress incontinence	2017-Aug-18	
Diverticulosis	2017-Aug-18	
Chronic loose stools/diarrhea NYD	2017-Aug-18	
Duodenitis/gastritis 2 nsaid use	2017-Aug-18	
HTN	2017-Aug-18	
Obesity	2017-Aug-18	
NIDDM	2017-Aug-18	

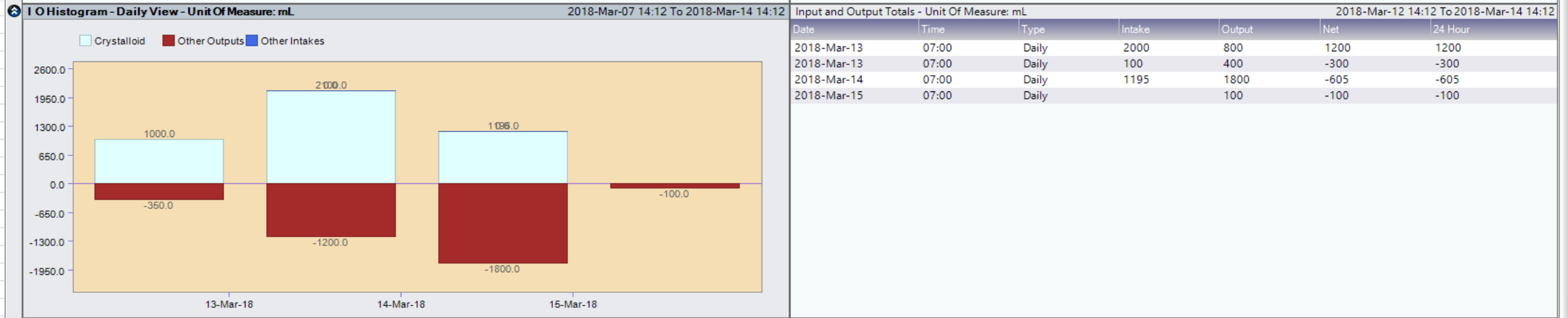
AKI Specific Medications

Medication	Order Date	Status	Last Given
MAY CAUSE AKI	-----	-----	-----
furosemide inj (Ordered as: LASIX inj) 40 mg IVPB /...	2017-Dec-21 10:42	Active	2017-Dec-22 09:52
furosemide inj 80 mg IV Q8H	2017-Dec-17 13:56	Discontinued	2017-Dec-18 06:11
CLEARED BY KIDNEY	-----	-----	-----
dalteparin inj 5,000 unit(s) SUBCUTANEOUSLY q24h, ---...	2017-Dec-16 22:13	Discontinued	
metoclopramide inj 10 mg IVPB q4h PRN nausea	2017-Dec-16 22:13	Active	
piperacillin / tazobactam inj (Each 2.25 g dose contains:...	2017-Dec-16 15:45	Active	2017-Dec-22 12:23
amoxicillin / clavulanate 500F tab (Each tablet...	2017-Dec-13 13:07	Discontinued	2017-Dec-16 03:52
sulfamethoxazole / trimethoprim DS tab (Each tab...	2017-Dec-08 14:39	Active	2017-Dec-22 09:53

IVs and Drips

IV and Components	Rate	Units	Status	Site	Row Comment
+ IV Solution (mL)			active		0.9% NaCl

Recognize: AKI Dashboard

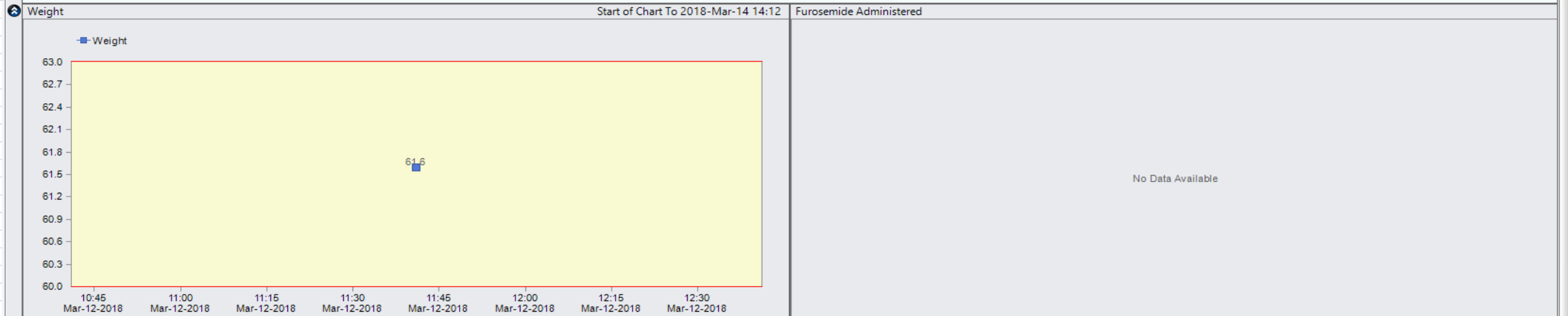


Input and Output Totals - Unit Of Measure: mL 2018-Mar-12 14:12 To 2018-Mar-14 14:12

Date	Time	Type	Intake	Output	Net	24 Hour
2018-Mar-13	07:00	Daily	2000	800	1200	1200
2018-Mar-13	07:00	Daily	100	400	-300	-300
2018-Mar-14	07:00	Daily	1195	1800	-605	-605
2018-Mar-15	07:00	Daily		100	-100	-100

Urine Output Daily - 0700 to 0659 Hrs

Date	Catheter Output (mL)	Urine Output (mL)	Urinary Drain (mL)	Total Output (mL)
2018-Mar-12	not recorded	350	not recorded	350
2018-Mar-13	800	400	not recorded	1200
2018-Mar-14	1800	not recorded	not recorded	1800
2018-Mar-15	100	not recorded	not recorded	100



Respond: AKI Order Set

Intravenous Therapies

Isotonic crystalloids are preferred for initial management for expansion of intravascular volume in patients with AKI. Crystalloids are preferred over colloid solutions in most scenarios - exceptions may include liver failure/suspected spontaneous bacterial peritonitis, and burns.

Risk of Fluid Overload Causing Cardio-Respiratory Compromise

Low: No history of heart failure. Left ventricular ejection fraction greater than 55%. No history of chronic kidney disease. No third spacing of fluids.

Intermediate: Heart failure (mild systolic dysfunction). Left ventricular ejection fraction 45-55%. History of chronic kidney disease. Minor third spacing of fluids.

High: History of heart failure (moderate or severe dysfunction). Left ventricular ejection fraction less than 45%. History of advanced chronic kidney disease. Significant third spacing of fluids.

Select appropriate solution according to risk for fluid overload

Select 0.9% NaCl infusion: if intravascular expansion WITHOUT alkalinization.

Select lactated ringers (LR): if intravascular volume expansion WITH alkalinization.

Hypovolemic/Volume responsive pt - NaCl

Order	Bolus	Bolus Volume (mL)	Frequency	Adjustable Rate	Start Priority	Stop After	Advisory Note	Additional Information
LOW risk - 2 item(s)								
<input type="checkbox"/> 0.9% NaCl infusion	<input checked="" type="checkbox"/>		once	Give over 15 to 30 minutes	STAT		Recommended: 250 to 1000 mL.	INITIAL bolus.
<input type="checkbox"/> 0.9% NaCl infusion	<input checked="" type="checkbox"/>		q1h	Give over 15 to 30 minutes	Routine		Recommended: 250 to 1000 mL.	REPEAT bolus...
INTERMEDIATE risk - 2 item(s)								
<input type="checkbox"/> 0.9% NaCl infusion	<input checked="" type="checkbox"/>		once	Give over 15 to 30 minutes	STAT		Recommended: 100 to 500 ml.	INITIAL Bolus
<input type="checkbox"/> 0.9% NaCl infusion	<input checked="" type="checkbox"/>							
HIGH risk - 2 item(s)								
<input type="checkbox"/> 0.9% NaCl infusion	<input checked="" type="checkbox"/>							
<input type="checkbox"/> 0.9% NaCl infusion	<input checked="" type="checkbox"/>							

Patient Care

Please specify fluid safety and efficacy parameter targets in the clinical communication orders below.

Order	Who	When	Frequency	Additional Information
Notify - 1 item(s)				
<input type="checkbox"/> Notify	Attending Physician	Immediately - when Volume Administration Safety Concerns are...		
Monitoring - 2 item(s)				
<input checked="" type="checkbox"/> Vital Signs			q1h	Start prior to initiation of each bolus...
<input checked="" type="checkbox"/> Monitor Output			q30min	after each bolus infusion.
Safety and Efficacy parameters - 2 item(s)				
<input type="checkbox"/> Clinical Communication				Stop bolus infusion if Volume...
<input type="checkbox"/> Clinical Communication				Stop bolus infusion if Volume...

Respond: AKI Order Set

Medication Safety

Consider discontinuation of nephrotoxic drugs / medications that affect kidney function. Consider discontinuing or dose adjustment of renally cleared drugs for cases of persistent severe AKI (e.g. greater than or equal to Stage 2 AKI doubling score or sustained beyond 48 hours).

Order	Date Requested For	Priority	Reason for Referral	Referral Instructions	Additional Information
- Pharmacist Consult - 1 item(s)					
<input type="checkbox"/> Pharmacist Consult	T	Routine		1. Routine requests will be followed up...	

Refer: AKI Order Set

Consults

Consider discussing the management of AKI with a nephrologist when one or more of the following are present:

Possible diagnosis that may need specialist treatment

AKI of unclear etiology

Progressive AKI despite correction of pre-renal/post-renal factors

Kidney Transplant

Pre-existing advanced chronic kidney disease, eGFR less than 30 mL/min/1.73 m²

Complications associated with AKI which may require renal replacement therapy

In the setting of AKI in conjunction with liver failure or heart failure, hepatology/nephrology or cardiology/nephrology consultations should be considered. Consider consulting a transplant service when AKI occurs in conjunction with immunosuppression for solid organ transplant.

Consult - Nephrology

MD Consult

Consult - Hepatology

MD Consult

Consult - Cardiology

MD Consult

Consult - Transplant

MD Consult



Contact us:



Study inquiries or feedback about the tools and processes?

Meha Bhatt, Project Coordinator

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