Solutions for Patient Safety: Nephrotoxic AKI (SPS NAKI) Pioneer Cohort

September 2019

UR MEDICINE | GOLISANO CHILDREN'S HOSPITAL

MEDICINE *of* THE HIGHEST ORDER

SPS: NAKI Pioneer Cohort

- Vision Statement:
  - Children should only get the nephrotoxic medications they need for the duration they need them
- Aims:
  - **Global aim:** eliminate all nephrotoxic medication-associated acute kidney injury (NAKI) in hospitalized children
  - **Smart Aim**: Decrease the NAKI rate by 30% in non-ICU population by December 31, 2019
  - **Smart aim**: Measure NAKI in ICU settings

Nephrotoxic Medication Associated AKI (NAKI)

- Nephrotoxic medication exposures (NTMx)
  - Over 80% of patients have ≥ 1 NTMx
  - ≥ 3 NTMx in 1 day associated with ↑ risk for AKI
- NAKI
  - Common cause of AKI in non-critically ill hospitalized children
    - ~ 25% of inpatients
    - Underestimated due to
      - lack of systematic surveillance of kidney function in exposed pts
      - non-oliguric nature of NAKI

Clinical significance of NAKI

- Increased LOS, cost, risk of CKD
  - 70% of children with NAKI had evidence of residual renal damage 6 mo later

6 mo post NAKI	NTMx w/ AKI	NTMx w/o AKI	p
eGFR (Cr) (ml/min/1.73 m^2)	113.8 (n =77)	123.4 (n =57)	0.04
< 60 (CKD Stage $\leq$3)	2	0	
60-90 (CKD Stage 2)	16	0	
90-150 (CKD Stage 1)	50	56	
>150 (Hyperfiltration)	9	1	
eGFR (Cys-C) (ml/min/1.73 m^2)	80.2	111.4	<0.01
U prot/cr	0.9	0.27	0.04
HTN	38%	19%	0.01

- Early detection is key
  - Minimize nephrotoxins
  - Provide supportive care

NAKI Definitions

- **AKI definition** (for this cohort)
  - ↑ in creatinine at least 50% above baseline
    - Baseline creatinine = lowest creatinine in the past 6 months
    - Creatinine must reach 0.5 mg/dL to be called AKI

    OR

  - An absolute ↑ in baseline serum creatinine ≥ 0.3 mg/dL over 48 hours

    regardless of max Cr

- **NAKI definition** – AKI that occurs w/in 2 days of nephrotoxic med exposure
  - **Exposure**
    - ≥ 3 nephrotoxic medication exposures (NTMx) on 1 day

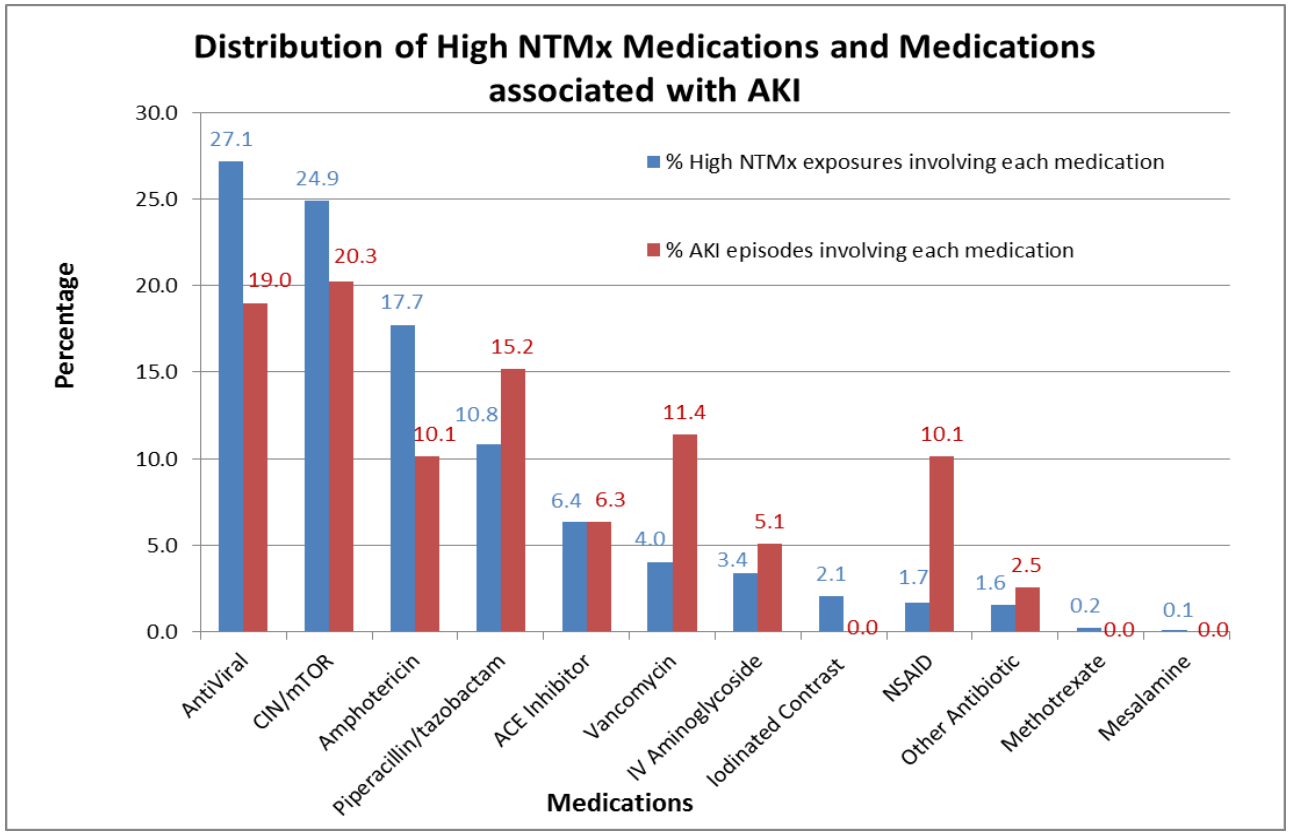
      OR

    - ≥ 3 consecutive days of vancomycin or aminoglycoside
    - *NB* - IV contrast, Amphotericin B, cidofovir count for 6 days post administration

Nephrotoxic Medication List

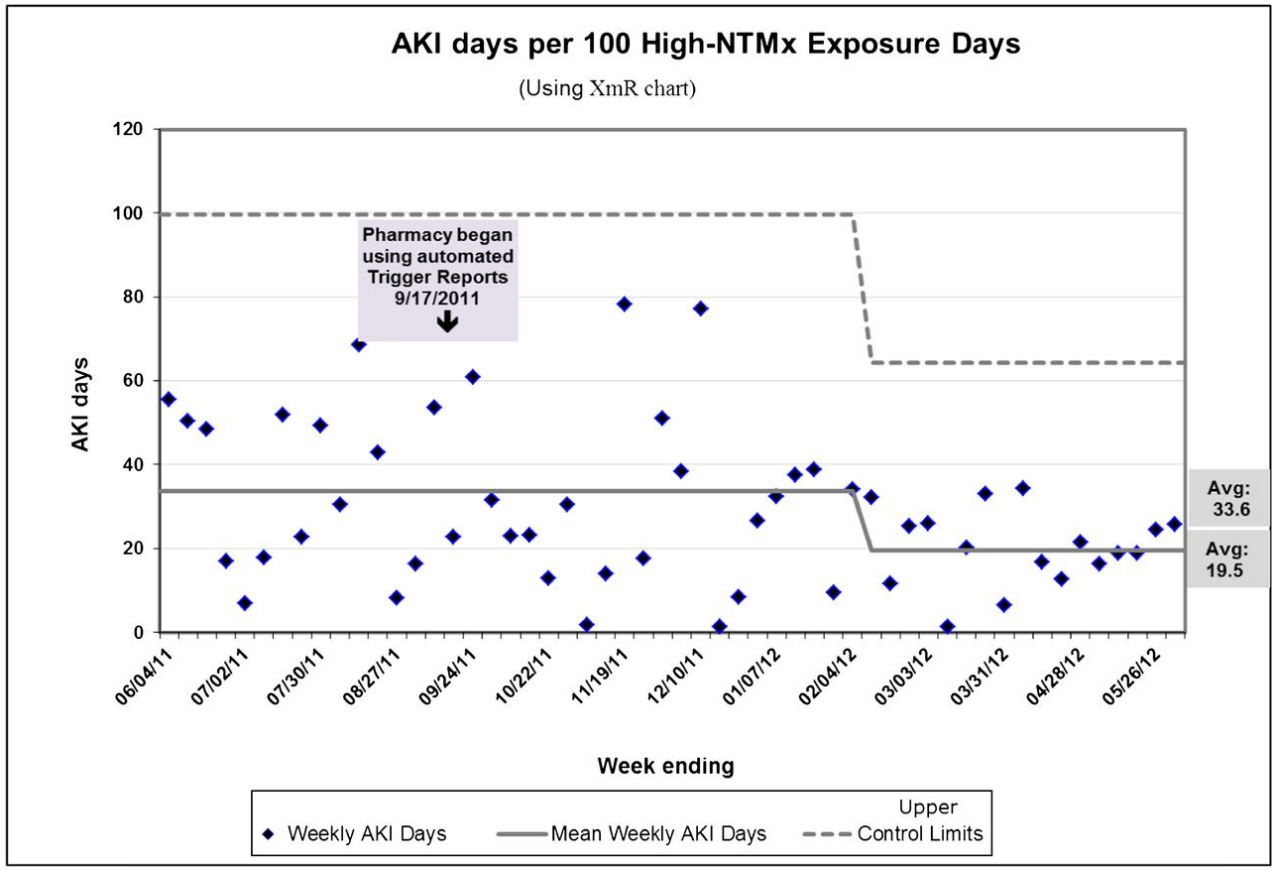
Drug	Therapeutic monitoring recommend	Medications which count as an exposure for 7 d	Medications which can trigger without another medication on day 3 of exposure
Acyclovir			
Ambisome			
Amikacin	X		X
Amphotericin B		X	
Aspirin			
Captopril			
Carboplatin			
Celecoxib			
Cidofovir		X	
Cisplatin			
Colistimethate			
Cyclosporine	X		
Deferasirox			
Diatrizoate meglumine		X	
Diatrzoate sodium		X	
Enalapril			
Enalaprilat			
Foscarnet			
Ganciclovir			
Gentamicin	X		X
Ibuprofen			
Iphosphamide			
Indomethacin			
Iodixanol (Vispaque)		X	
Iohexol (Omnipaque)		X	
Iopamidol (Isovue)		X	
Iopromide		X	
Ioversol		X	
Ioxaglate meglumine and ioxaglate sodium		X	

Drug	Therapeutic moitoring recommend	Medications which count as an exposure for 7 days	Medications which can trigger without another medication on day 3 of exposure
Ioxilan		X	
Ketorolac			
Lisinopril			
Lithium	X		
Losartan			
Mesalamine			
Methotrexate	X		
Mitomycin			
Nafcillin			
Naproxen			
Pamidronate disodium			
Pentamidine			
Piperacillin			
Piperacillin/Tazobactam			
Polymixin B			
Sirolimus	X		
Sulfasalazine			
Tacrolimus	X		
Tenofovir			
Ticarcillin/Clavulanic			
Tobramycin	X		X
Topiramate			
Valacyclovir			
Valganciclovir			
Valsartan			
Vancomycin	X		X
Zoledronic acid			
Zonisamide			



Pediatrics 2013;132:e756–e767

Weekly average AKI intensity rates measured as days in AKI by the pRIFLE per 100 days of high nephrotoxic medication (NTMx) exposure.

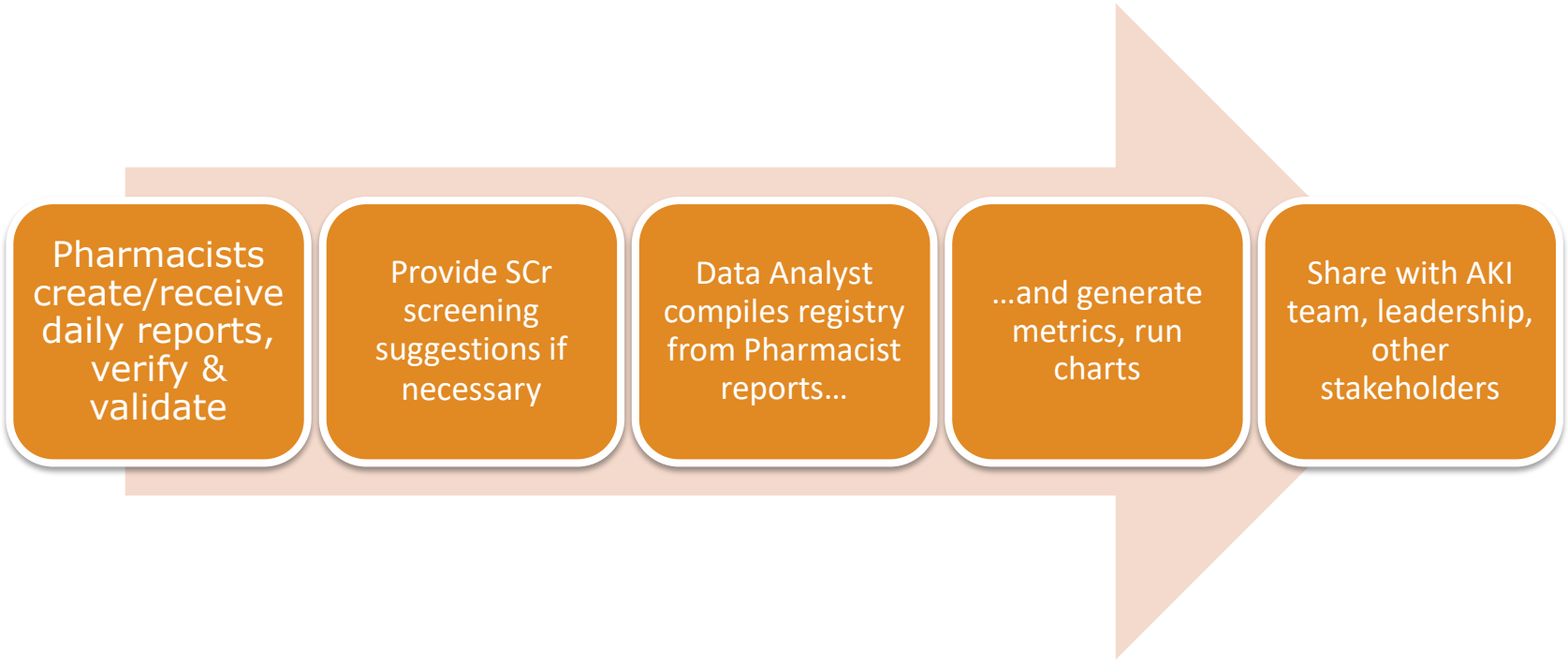


Stuart L. Goldstein et al. Pediatrics 2013;132:e756-e767

NAKI preliminary data – GCHaS (non-ICU pts)

	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	SPS data range
#NTMx exposures	26	23	33	20	20	35	
#NTMx w/ baseline sCr (%)	21 (81)	22 (96)	29 (88)	19 (95)	19 (95)	32 (91)	
#NTMx w/ daily sCr (%)	6 (23)	8 (35)	7 (21)	5 (25)	6 (30)	4 (11)	
#NAKI episodes	3	2	2	1	1	?	
% NTMx resulting in AKI	11.5	8.7	6	5	5		8 - 13%

The Process


Pharmacists create/receive daily reports, verify & validate
Provide SCr screening suggestions if necessary
Data Analyst compiles registry from Pharmacist reports…
…and generate metrics, run charts
Share with AKI team, leadership, other stakeholders

NAKI implementation at GCHaS

- **Inclusion**
  - All non-ICU inpatients 7N/S, 8N/S
    - Exclusions: ESRD (SPS exclusion)
    - Pt in Wilmot Cancer Center and pts off tower (GCH exclusion)
  - PICU and PCCC pts
- Monitor NICU pts for exposure but

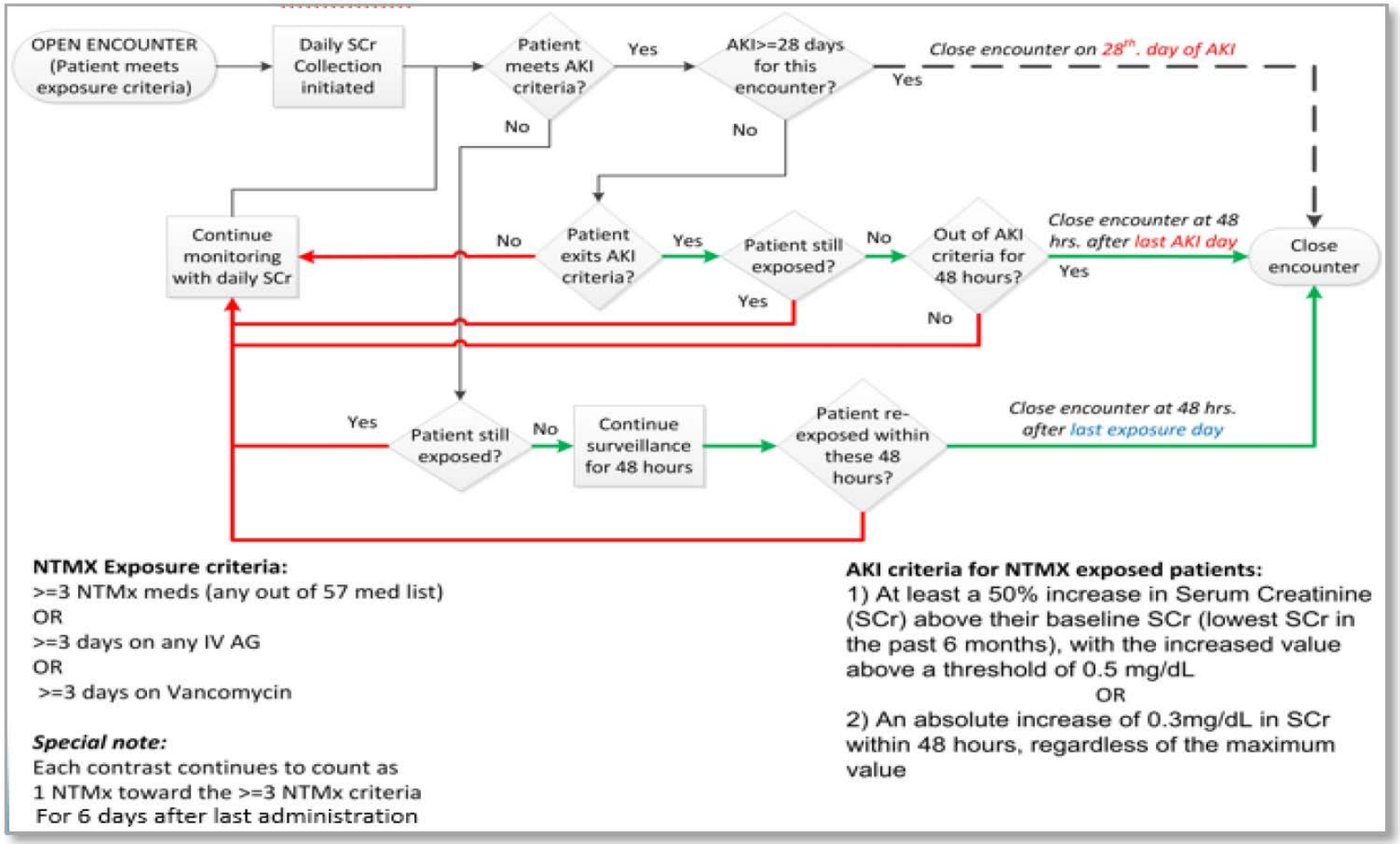
NTM Exposure Algorithm

- Pt meets exposure criteria
  - Open encounter
  - Check daily Cr during period of exposure and up to 48 hrs after last exposure
- Pt meets AKI criteria
  - Monitor daily Cr until back to baseline for 48 hrs *and no further exposure*
    - If still exposed continue daily Cr until 48 hr after last exposure

NAKI Implementation at GCHaS

- **Peds pharmacy to contact provider if pt meets exposure criteria**
  - Opportunity for education;
  - Pharmacist will recommend creatinine monitoring & can place order if provider agrees
  - Per NAKI surveillance, pt should have daily Scr monitored until
    - 48 hrs after exposure stops, *OR*
    - 48 hrs after AKI resolves, *OR*
    - Up to 28 days following AKI episode which does not resolve
- **Nephrologist to contact provider if sCr not ordered** to explore barriers to daily sCr monitoring

Nephrotoxic Medications



Education and resources

- NAKI team
- Pharmacy
- Peds Nephrology website
- Peds ID website
  - Link to the list of nephrotoxic medications

GCHaS NAKI Team

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