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Contextual Factors Affecting the Success of a Medication Safety Intervention to Decrease Acute Kidney Injury

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Background and Objectives

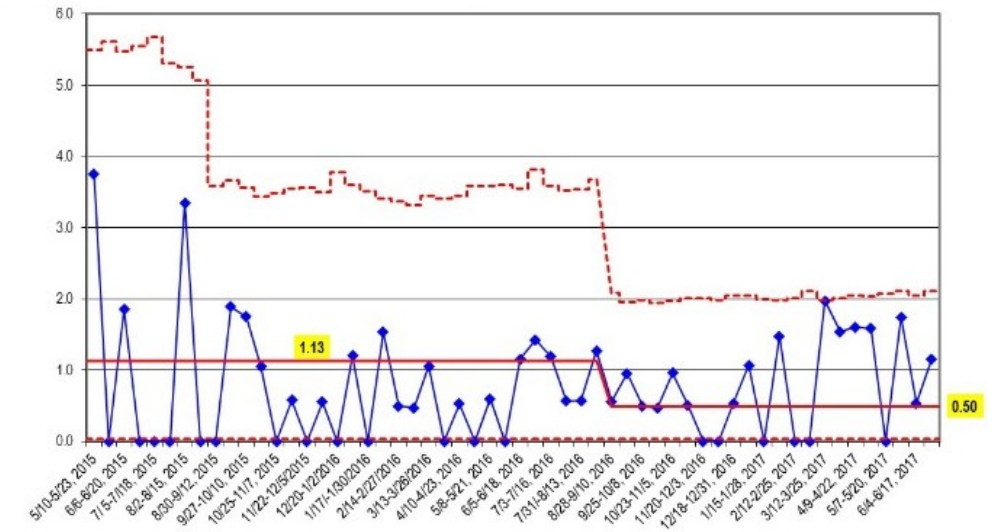
- Nephrotoxic medication exposure (NTMx) is a common cause of acute kidney injury (AKI) in hospitalized children.
- The Nephrotoxic Injury Negated by Just-in-Time Action (NINJA) safety program seeks to reduce AKI via weekday screening of hospitalized patients for high NTMx.
- Pilot study reduced NTMx-associated AKI by 62% at one hospital center.
- Dissemination of NINJA to 9 collaborative partners avoided an estimated 644 high NTMx exposures and 346 NTMx-AKI episodes over 2 years of study.
- Significant AKI reduction at 5 of 9 hospital centers.
- Research questions: What contextual factors are associated with NINJA's success at these 5 centers? What issues should hospitals consider when implementing NINJA? Are there necessary or sufficient conditions for achieving significant AKI reduction?

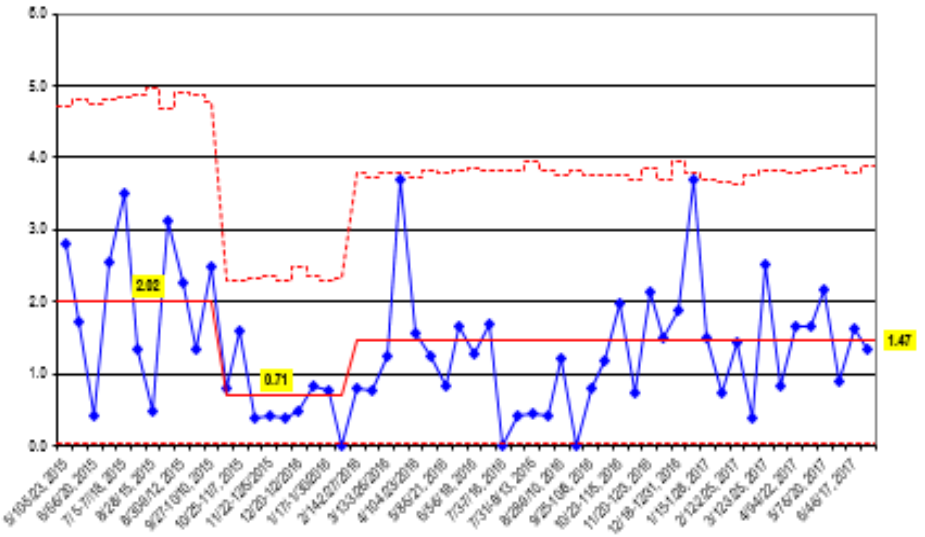
Collaborative Network and Data Collection

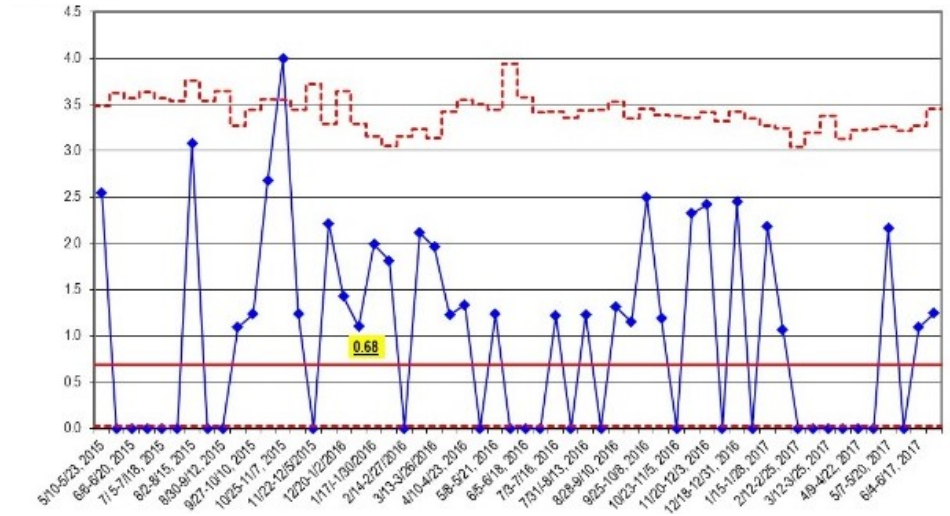
- 9 pediatric hospitals from 8 U.S. states
  - structurally diverse: free-standing children's hospitals vs "children's hospital within a hospital"
- Data collection
  - Weekday screenings for high NTMx of non-ICU patients without urinary tract infection (NINJA intervention)
  - Bi-weekly reports of NTMx and AKI rates
  - Quarterly web-based survey of:
    (a) participation in dissemination program
    (b) personnel resources dedicated to NINJA
    (c) progress and impediments in implementing NINJA automated trigger tool
  - Semi-structured interviews with NINJA team members

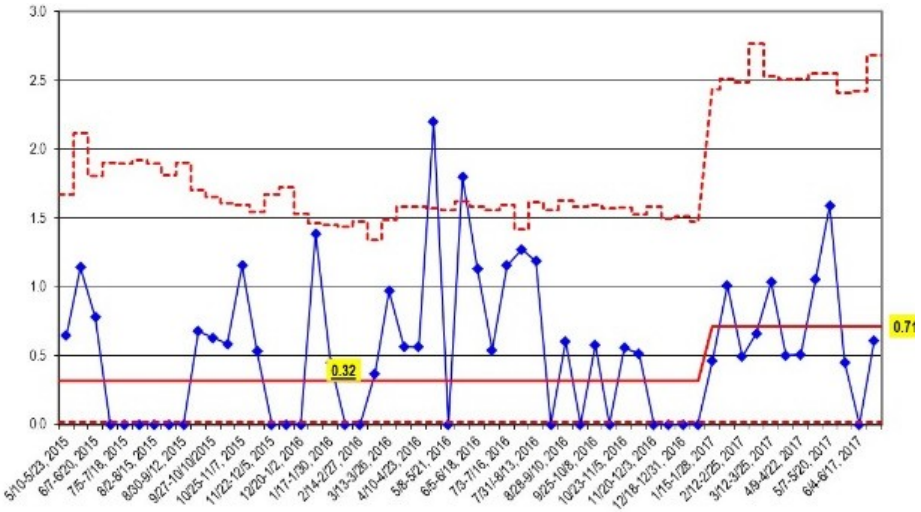
Outcome and Explanatory Conditions

- Outcome: Significant Decrease in AKI rate
  - presence/absence of a downward centerline shift in NTMx-related AKI per 1000 non-ICU patient-days









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  - Based on Model for Understanding Success in Quality (MUSIQ)
  - Network participation
  - Implementation factors
  - Contextual factors

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  - Network participation
    - Participation in monthly webinars
    - Submission of monthly data
  - Implementation factors
  - Contextual factors

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  - Network participation
  - Implementation factors
    - Initial NTMx-related AKI rate
    - Progress in building automated trigger-tool
  - Contextual factors

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  - Implementation factors
  - Contextual factors
    - Competing organizational priorities and delay severity
    - Assigned personnel:
      - Presence & hours of pharmacist, QI, and data champions
      - Number of dedicated pharmacists

Methodology and Data Calibration

- Method: inductive csQCA w/panel data (cf. Ragin 2014)
- Measures and Calibrations:
  - Starting AKI centerline >1.0, >2.0
  - Initial period (first six months)
    - delay due to other organizational priorities reported in either of first two quarterly surveys
    - for all other conditions, used 2nd quarterly survey
  - Established period
    - period until first AKI centerline downshift or end of study
    - condition is “generally present” when hospital reported its presence on at least 75% of quarterly surveys

Results and Interpretation

Necessary conditions		ncon	ncov	# hospitals w/nec cond
N1	Initial centerline > 1.0	1.0	0.83	6
N2	Report build in progress w/in 6 mos	1.0	0.63	8
	Solution	1.0	0.83	
Sufficient conditions		scon	scov	# hospitals w/suf cond
S1	Pharmacist champion w/hours, *and* **Consistent report build**, *and* **2+ pharmacists assigned**	1.0	0.8	4
S2	**No pharmacist champion**, *and* No assigned pharmacists, *and* No QI or data champion, *and* **No consistent report build**, *but* **No other organizational priorities**	1.0	0.2	1
	Solution	1.0	1.0	

* Core conditions in **bold**

QCA and (Very) Small-N Research

- Most QCA projects are 15-50+ observations and 5-12 conditions
  - a challenge for diversity-oriented research with few observations is that each observation carries great weight
- Some QCA researchers argue that number of observations (N) limits number of conditions (C) — “too many conditions; too few cases”
- Such a directive betrays a conventional statistical perspective that assumes the independence of variables (conditions)
- In fact, QCA is helpful for managing the complexity associated with high C/N ratios
- QCA views cases as holistic configurations and configurations as *combinations* of conditions
- QCA seeks to identify meaningful set-theoretic relations: consistency, coverage, truth tables, etc are but means to this end

QCA and Longitudinal Research

- How to measure change set theoretically?
- Strategy 1: Embed measure of change into conditions
  - Ragin 2014
  - Outcome: Improvement in AKI rate
- Strategy 2: Define separate conditions for different time periods
  - Initial period vs established period
- Strategy 3: Use set coincidence to measure how sets or truth tables change over time
  - e.g., Rubinson and Mueller 2016