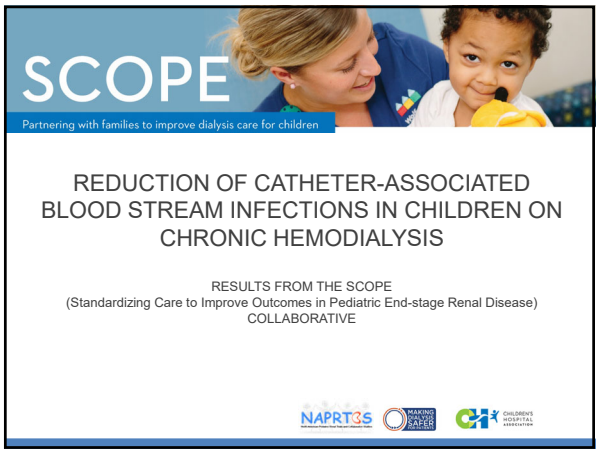

REDUCTION OF CATHETER-ASSOCIATED BLOOD STREAM INFECTIONS IN CHILDREN ON CHRONIC HEMODIALYSIS

RESULTS FROM THE SCOPE
(Standardizing Care to Improve Outcomes in Pediatric End-stage Renal Disease)
COLLABORATIVE

NAPRT3S · MAKING DIALYSIS SAFER · CHILDREN'S HOSPITAL ASSOCIATION

SCOPE CENTERS

47 AND GROWING!

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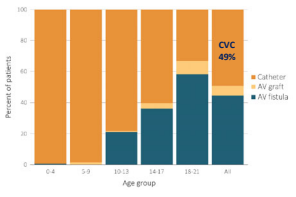
BACKGROUND



- Infection in pediatric ESRD (USRDS 2018):
  - 2nd leading cause of mortality
  - leading cause of hospitalizations
- As of 12/2016 there were 9619 patients <22 years with ESRD:
  - 17.2% (1651) on HD
  - 49% received HD via a catheter
- Need to minimize the risk for catheter associated BSI (CA-BSI)
- There are no pediatric specific guidelines on best practices for CA-BSI prevention.

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METHODS

- SCOPE Collaborative was developed under the guidance of the quality improvement experts of the Children's Hospital Association
- In its HD arm, the SCOPE standardizes HD vascular access care via implementation of specific catheter care "bundles"
- The SCOPE HD tunneled catheter care bundles address 5 categories of catheter care

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TUNNELED HD CATHETER CARE BUNDLES

I. HD Catheter Dressing/Site Assessment
- The HD site should be visually assessed through the transparent dressing at least daily for signs and symptoms of infection or complications.
- Do not expose or submerge the dressing, catheter, or cap in water. Precautions should be taken to cover when bathing or showering.

II. HD Catheter Connection/Entry Procedure
- Proper hand hygiene per WHO guidelines
- Use Personal Protective Equipment including:
  - new, clean exam gloves
  - proper face protection
- Mask for patient's face or trach
- Hub/cap disinfected
- Connect catheter to blood lines using aseptic technique
- Remove gloves and perform hand hygiene per WHO guidelines

III. HD Catheter Disconnection
- Proper hand hygiene per WHO guidelines
- Use Personal Protective Equipment including:
  - new, clean exam gloves
  - proper face protection
- Mask for patient's face or trach
- Disconnect using aseptic technique
- Hub/cap disinfected
- Remove gloves and perform hand hygiene per WHO guidelines

IV. Cap Care Procedure
- Cap changed on a schedule specified by manufacturer (every treatment for standard caps, every 7 days for closed connector luer access cap)

V. HD Exit Site Care and Dressing Change Procedure
- Proper hand hygiene per WHO guidelines
- Use Personal Protective Equipment including:
  - new, clean exam gloves
  - proper face protection
- Mask for patient's face or trach
- Antiseptic applied to exit site and allowed to dry

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METHODS

- All patients on chronic HD via tunneled HD catheter
- Implementation 48 months: June 2013 – May 2017
- Pre-implementation: 12 months prior
- Bundle compliance monitored via maintenance observation form; confirmed if "all or none"
- Statistical methods: generalized linear mixed model (GLMM)
- *CA-BSI definition: positive blood culture from a HD patient as an outpatient for which the suspected source is the vascular access or is otherwise uncertain*
- CA-BSI rate reported as infections per 100 pt months

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CA-BSI DEFINITION AND REPORTING

- Pre-implementation:
  - CA-BSI that were adjudicated at the center level (possible variation by center)
- Post-implementation:
  - Report all positive blood cultures
  - Provide additional clinical information to allow adjudication of the blood culture by an Infectious Disease specialist:
    - presence of signs/symptoms of infection
    - number of positive and negative blood cultures and sources
    - presence of an infection elsewhere
    - positive cultures from other sources (i.e. urine culture)

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RESULTS

- 15 centers
- 325 pts (311 pre)
- 4170 pt months (1341 pre)
- BSIs: 90 (54 pre)
- Catheters:
  - RIJ ~80%
  - placed in OR ~65%
- 3996 catheter care observations

1. Boston Children's Hospital
2. Cincinnati Children's Hospital Medical Center
3. Johns Hopkins Children's Center
4. Children's Mercy Hospitals and Clinics
5. Children's Medical Center Dallas
6. Seattle Children's Hospital
7. Children's Hospital of Wisconsin
8. Nationwide Children's Hospital
9. Arkansas Children's Hospital
10. Texas Children's Hospital
11. The Children's Hospital of Philadelphia
12. Alfred I Du Pont Hospital for Children
13. Steven and Alexandra Cohen Children's Medical Center
14. Levine Children's Hospital
15. Driscoll Children's Hospital

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PATIENTS

Demographic characteristic	Total	Pre	Post	P-value
	N=636	N=311	N=325	
Age, Median (IQR)	14 (8,17)	15 (10,17)	12 (6, 16)	<0.001
Age, N(%)				<0.001
0-1 yrs	39 (6.1)	12 (3.9)	27 (8.3)	
2-5 yrs	72 (11.3)	24 (7.7)	48 (14.8)	
6-12 yrs	160 (25.2)	71 (22.8)	89 (27.4)	
13-17 yrs	257 (40.4)	138 (44.4)	119 (36.6)	
>18 yrs	108 (17.0)	66 (21.2)	42 (12.9)	
Sex, N(%)				0.081
M-1	356 (56.0)	185 (59.5)	171 (52.6)	
F-2	280 (44.0)	126 (40.5)	154 (47.4)	
Race, N(%)				<0.001
White -1	246 (38.7)	136 (43.7)	110 (33.8)	
Black-2	179 (28.1)	95 (30.5)	84 (25.8)	
Other-9	211 (33.2)	80 (25.7)	131 (40.3)	
ESRD cause, N(%)				<0.001
CAKUT	225 (35.4)	85 (27.3)	140 (43.1)	
GN	103 (16.2)	49 (15.8)	54 (16.6)	
NS/FSGS	95 (14.9)	45 (14.5)	50 (15.4)	
Other	213 (33.5)	132 (42.4)	81 (24.9)	

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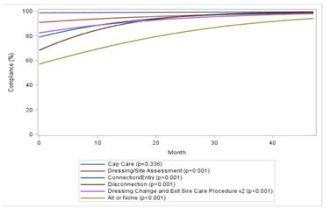
OBSERVATIONS AND COMPLIANCE

I. HD Catheter Dressing/Site Assessment, N=3739 N(%)	3603 (96.4)
The HD site should be visually assessed through the transparent dressing at least daily for signs and symptoms of infection or complications	3738 (100.0)
Precautions should be taken to prevent dressing from getting wet or cap in water. Precautions should be taken to cover when bathing or showering	3602 (96.3)
II. HD Catheter Connection/Entry Procedure, N=3210, N(%)	3037 (94.6)
Proper hand hygiene per WHO guidelines	3192 (99.4)
Use Personal Protective Equipment including:	
new, clean exam gloves	3195 (99.5)
proper face protection	3179 (99.0)
Mask for patient's face or trach	2853 (88.2)
Hub/cap disinfected	3163 (98.5)
Connect catheter to blood lines using aseptic technique	3192 (99.4)
Remove gloves and perform hand hygiene per WHO guidelines	3186 (99.8)
III. HD Catheter Disconnection, N=2991, N(%)	2738 (95.5)
Proper hand hygiene per WHO guidelines	2868 (99.6)
Use Personal Protective Equipment including:	
new, clean exam gloves	2868 (99.6)
proper face protection	2858 (99.2)
Mask for patient's face or trach	2528 (87.8)
Disconnect using aseptic technique	2862 (99.3)
Hub/cap disinfected	2804 (97.3)
Remove gloves and perform hand hygiene per WHO guidelines	2825 (98.1)
IV. Cap Care Procedure, N=2955, N(%)	2929 (99.1)
Cap changed on a schedule specified by manufacturer (every treatment for standard caps, every 7 days for closed connector luer access cap)	2416 (81.9)
V. HD Exit Site Care and Dressing Change Procedure, N=2328, N(%)	2156 (94.4)
Proper hand hygiene per WHO guidelines?	2306 (99.1)
Use Personal Protective Equipment including:	
new, clean exam gloves	2316 (99.5)
proper face protection	2316 (99.5)
Mask for patient's face or trach	2242 (96.3)
Antiseptic applied to exit site and allowed to dry?	2292 (98.5)
Overall Compliance, N(%)	**3004 (87.8)**



- Compliance increased in 4/5 bundle categories
- Most improved in catheter disconnection (68.3% → 99.5%)
- Cap care w/o change with starting compliance of 98.8%

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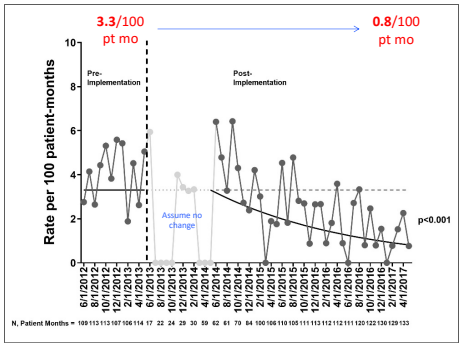
CA-BSI rate: Interrupted time series results



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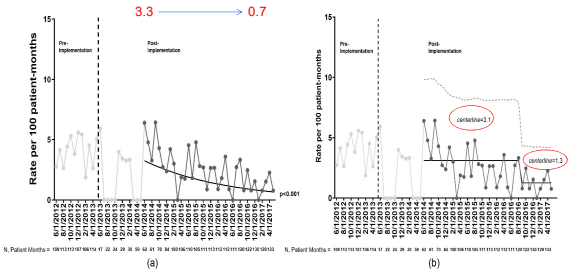
SUB-ANALYSIS OF THE FINAL 36 MONTHS OF THE STUDY PERIOD



GLMM regression analysis

SPC analysis: centerline shifted in 9/16 based on 9 consecutive points below the centerline

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Reported CA-BSI rates (per 100 patient months)

Reference	Pre	Intervention	Post
Pediatric Eisenstein et al, Clin J Am Soc Nephrol 6(4):793-8, 2011	?	Routine sterile use and care of HD catheters performed on a daily basis	1.56
Pediatric Paglialonga et al, Hemodial Int 18 Suppl 1:S13-8, 2014	5.1	Switching from povidone-iodine to chlorhexidine for exit-site	1.08
Adult Patel et al, Am J Kidney Dis 62(2):322-30, 2013	2.26	CDC Dialysis BSI Prevention Collaborative Interventions (chlorhexidinee for exit-site, staff training and competency assessments focused on catheter care and aseptic technique, hand hygiene)	1.08
Adult Nguyen et al, CJASN 12(7):1139-1146, 2017	3.1	Widespread BSI prevention efforts implemented by dialysis provider organizations	1.83
Adult Brunelli et al, J Am Soc Nephrol 29(4):1336-1343, 2018	3.06	Chlorhexidine coated barrier caps (ClearGuard)	0.84
SCOPE	3.3	Bundle	0.8

Reported pediatric HD CA-BSI rates without intervention:
3.3 – 30/100 pt months

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LIMITATIONS

- Selection bias is possible (voluntary patient enrollment and data submission by sites)
- Catheter care compliance was conducted on a random sampling of patients
  - centers were encouraged to rotate catheter care audits to capture all patients and providers
- Pre-implementation CA-BSI rate was obtained from events that were adjudicated at the center level
  - last 36-month period subanalysis ➔ same baseline CA-BSI rate with still significant decrease
- Post-implementation cohort was younger
  - would favor an increase in rates, not a decrease

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CONCLUSION

- SCOPE HD catheter care bundle was successful in decreasing CA-BSI rate
- This is the first report showing that strict adherence with recommended care practices can effectively reduce infection rates among children on HD
- Additional studies are needed to identify center specific areas that result in lower bundle compliance and affect CA-BSI rate.

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