17th Congress of the
International Society for Peritoneal Dialysis
VANCOUVER, CANADA | MAY 5-8, 2018

Colin White Lecture: The Standardizing Care to Improve Outcomes in Pediatric ESRD (SCOPE) Collaborative

Conflict of Interest

I have/had an affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

President, North American Pediatric Renal Trials and Collaborative Studies (NAPRTCS)

Participate in research funded by Amgen, Relypsa, Retrophin, AMAG and Luitpold

Quality Improvement

SCOPE Dialysis Collaborative

The Standardizing Care to Improve Outcomes in Pediatric ESRD (SCOPE) Collaborative

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JOHNS HOPKINS CHILDREN'S CENTER

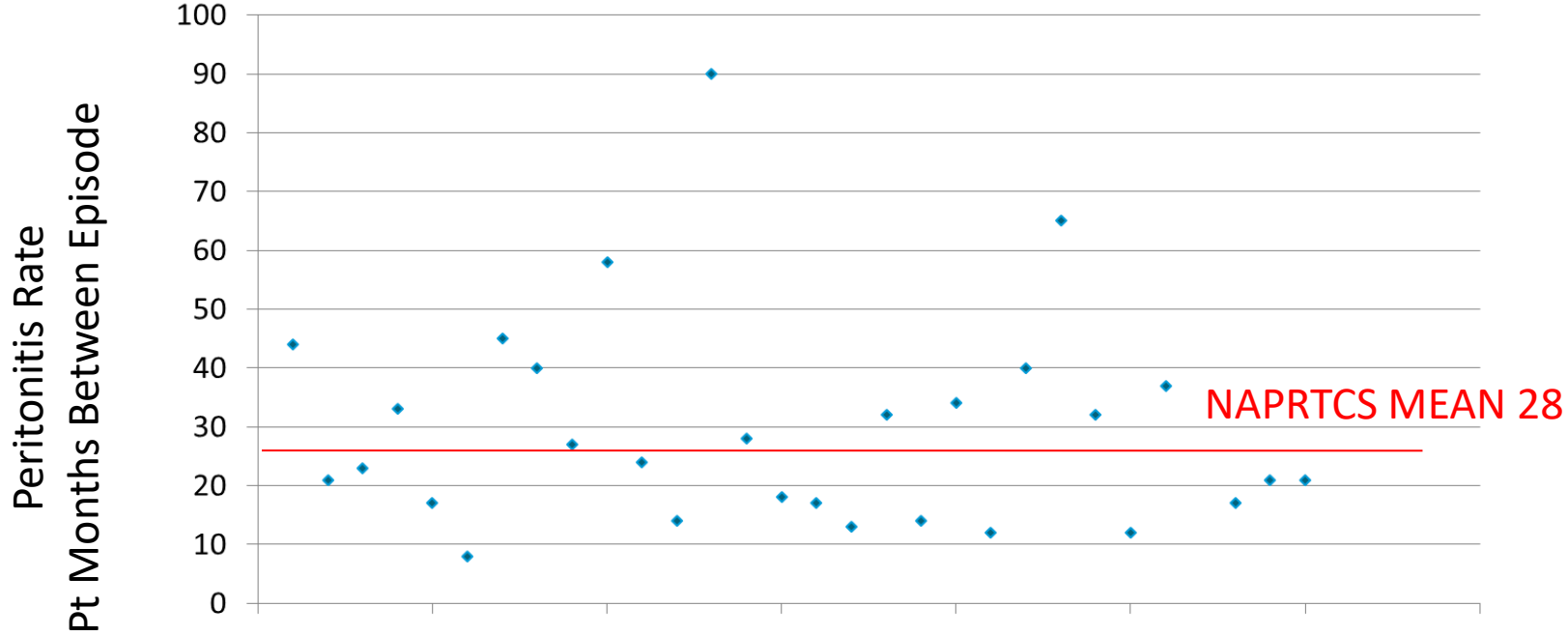
CHILDREN'S HOSPITAL ASSOCIATION

Background
Peritonitis

- Peritonitis is the leading cause for hospitalization in children on PD patients worldwide
- Recurrent peritonitis is a leading cause for PD failure
- Infection is a leading cause of mortality in children on PD

Preventing infection is an important priority for children on PD and their families!

Peritonitis Variability In US
(Pt months between episodes)



Each value represents mean peritonitis rate at single pediatric peritoneal dialysis facility between 2003-2008

SCOPE: A Quality Transformation Collaborative

- Hypothesis: Providing more standardized care across centers will improve outcomes
- Monitor adherence with standardized practices
- Use quality improvement methodology (small tests of change) to increase implementation of standardized practices

ARTICLE IN PRESS

Journal of Hospital Infection xxx (2016) 1–3

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Opinion

What is the right approach to infection prevention and control for children living at home with invasive devices?

success of programmes targeting HCAIs has radically changed the perception that HCAIs are inescapable, so much so that by 2012, the UK's National Institute for Health and Care Excellence guidelines referred to HCAIs as avoidable events to be viewed with a 'no-tolerance' attitude.[29]

What makes reductions in reported rates of HCAI especially remarkable is that they have been achieved largely without any

SCOPE Peritonitis Project

- **Increase implementation of standardized peritoneal dialysis catheter practices**
  - PD catheter insertion
  - Child/caregiver training
  - Follow up care
- **Lower rates of PD catheter related infections**
  - Peritonitis
  - Exit Site/Tunnel Infection

Neu AM, et al; Design of the standardizing care to improve outcomes in pediatric end stage renal disease collaborative. Pediatr Nephrol. 2014 Sep;29(9):1477-84

PD Catheter/Exit Site Follow-Up Care Bundle

- **Monthly visit**
  - Exit-site scored by RN (IPPN scoring)
  - Key aspects of hand hygiene, exit site care and aseptic technique reviewed
- **Every 6 month demo test and concept test**
- **Re-training after peritonitis episode**
- **Prophylactic antibiotics with touch contamination or other break in aseptic technique according to ISPD guidelines**

Objective

- Describe the results of the first 3 years of the SCOPE Peritonitis Project
  - October 1, 2011-September 30, 2014
  - Rates of compliance with follow up care bundle
  - Peritonitis rates

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Methods

- Enrollment criteria
  - Any child/young adult (≤ 21 years) with a chronic PD catheter at a participating center
- Demographics collected at enrollment
- Monthly reporting of compliance with care bundles
- Monthly reporting of infection events
- Historical demographic and infection data submitted for 13 months prior to launch

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Methods

- Monthly Compliance scoring all or none
- Infection rates for each center were calculated as an annualized rate =

$$\frac{\text{Number of infections during time period}}{\text{Peritoneal dialysis patient-years at risk}}$$

- Collaborative rates were calculated as the mean of the center rates

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Results

Current SCOPE Participants

43 Centers

Participating at Collaborative Launch October 2011

29 Centers

Provided pre-launch patient and infection data

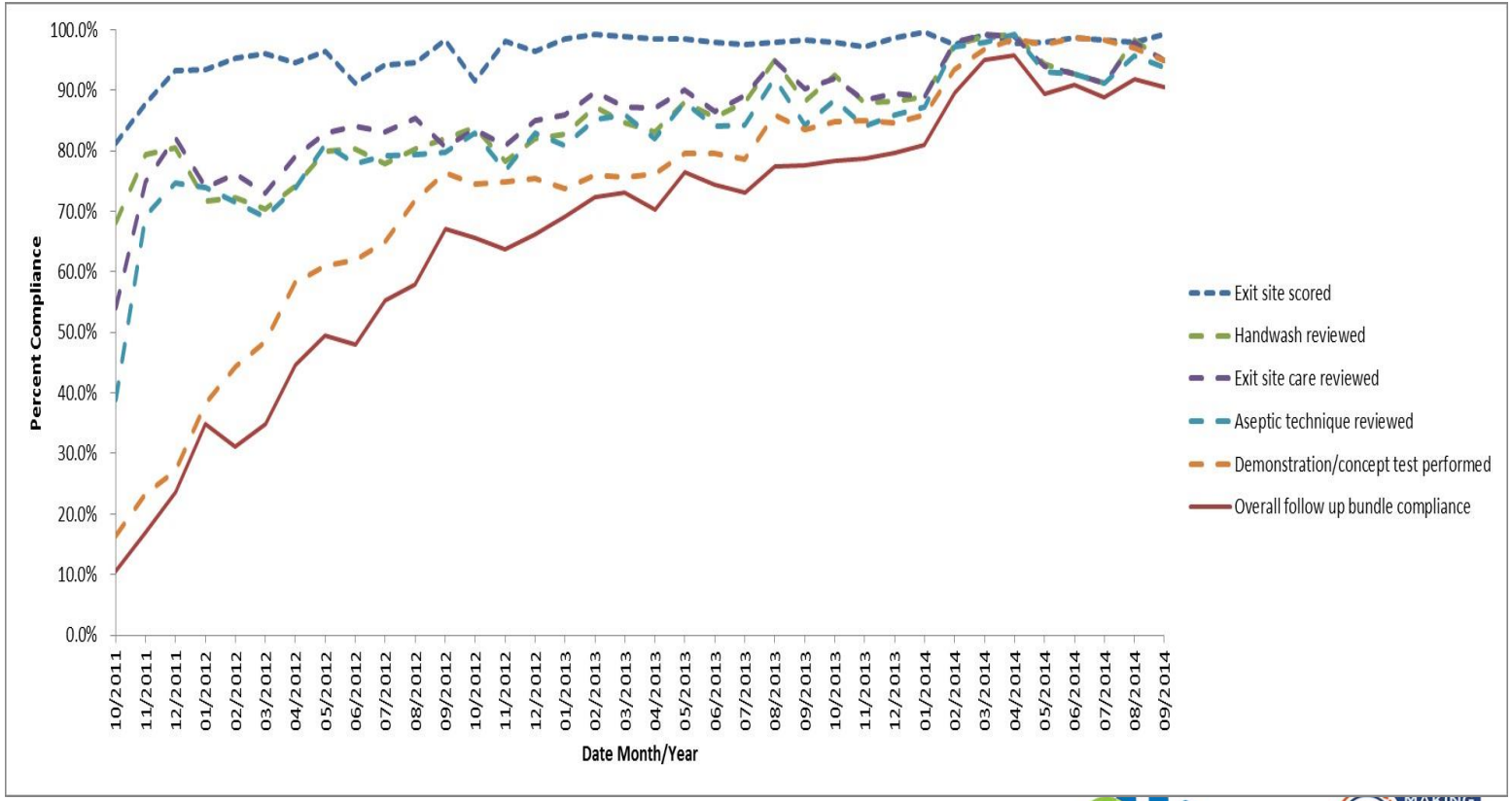
644 enrollments
7977 follow up forms

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Demographics (644 Enrollments)

Demographic Characteristic	N	Percent
Age at Enrollment		
0-2 years	184	28.5
2-5 years	79	12.3
6-12 years	130	20.2
13-17 years	206	32
18+ years	45	7
Sex		
Male	345	53.6
Race		
White	297	46.1
Black	115	17.9
Hispanic	167	25.9
Cause of end stage kidney disease		
CAKUT	246	38.2
Glomerulonephritis	82	12.7
Polycystic Kidney Disease	37	5.8
Focal and Segmental Glomerulosclerosis	85	13.2

Follow up Bundle Compliance



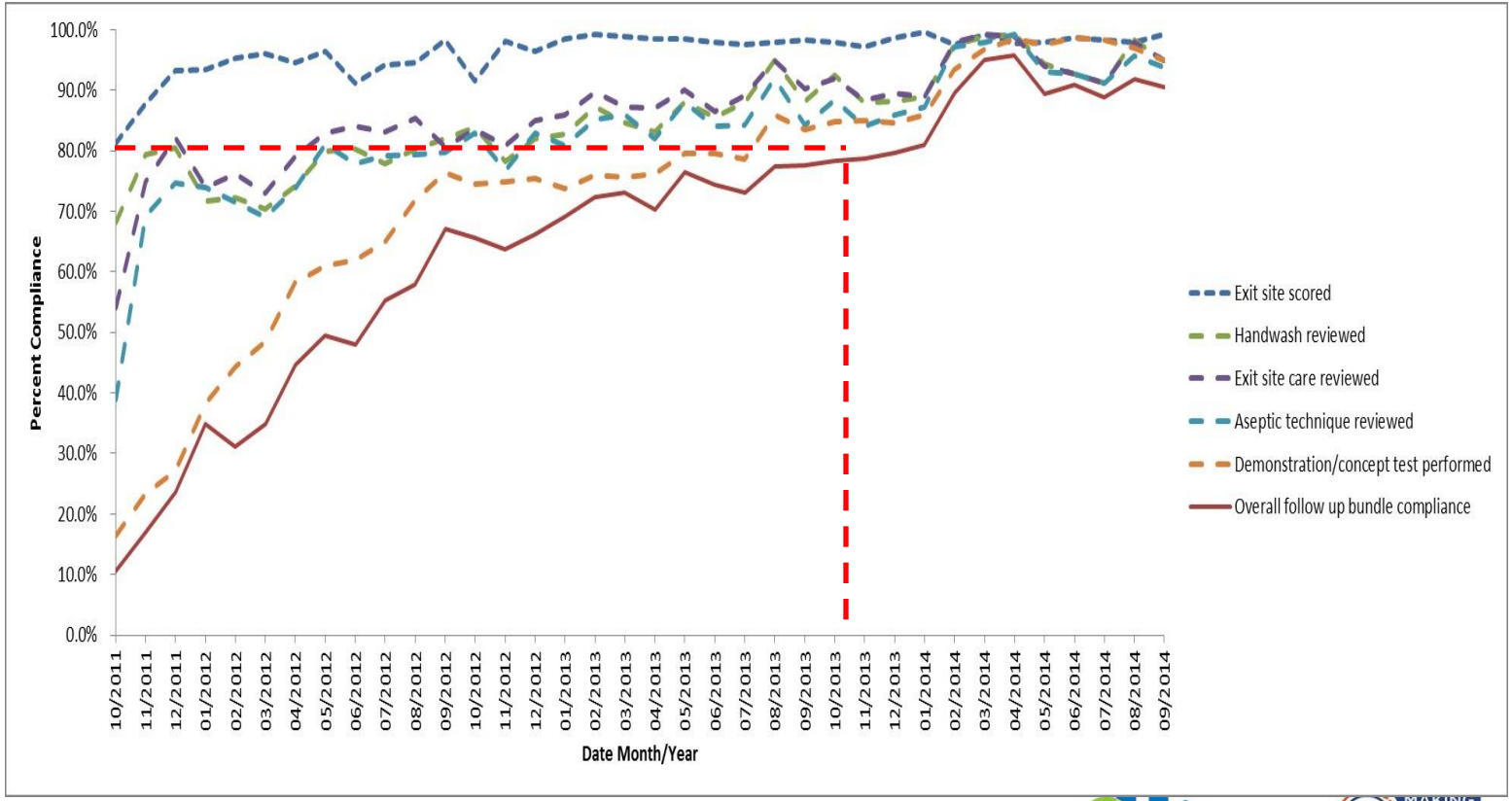
SCOPE Care Bundle Compliance

Bundle Compliance	OR	95% CI	P-Value
Follow up	1.10	(1.10,1.11)	<0.001
Follow up (w/ random Hosp Effect)	1.15	(1.11,1.19)	<0.001

Generalized Linear Mixed Model including a random center effect to account for center specific variability

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Follow up Bundle Compliance

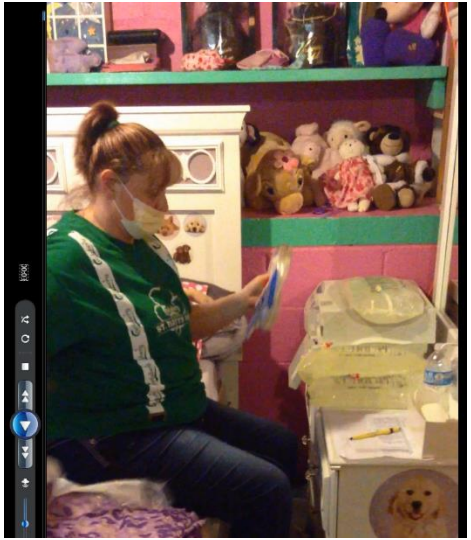


PD Catheter/Exit Site Follow-Up Care Bundle

- **Monthly visit**
  - Exit-site scored by RN (IPPN scoring)
  - Key aspects of hand hygiene, exit site care and aseptic technique reviewed
- **Every 6 month demo test and concept test**
- **Re-training after peritonitis episode**
- **Prophylactic antibiotics with touch contamination or other break in aseptic technique according to ISPD guidelines**

Examples of techniques to increase FU compliance/reduce “review” fatigue

- Have patient monitor provider hand washing
- Glo Germ™ to assess patient/caregiver hand washing technique
- Pt Video audits
- Use of video games
    - http://lizneu.github.io/cycler-video/
    - https://youtu.be/-8j5d-W8Sdc



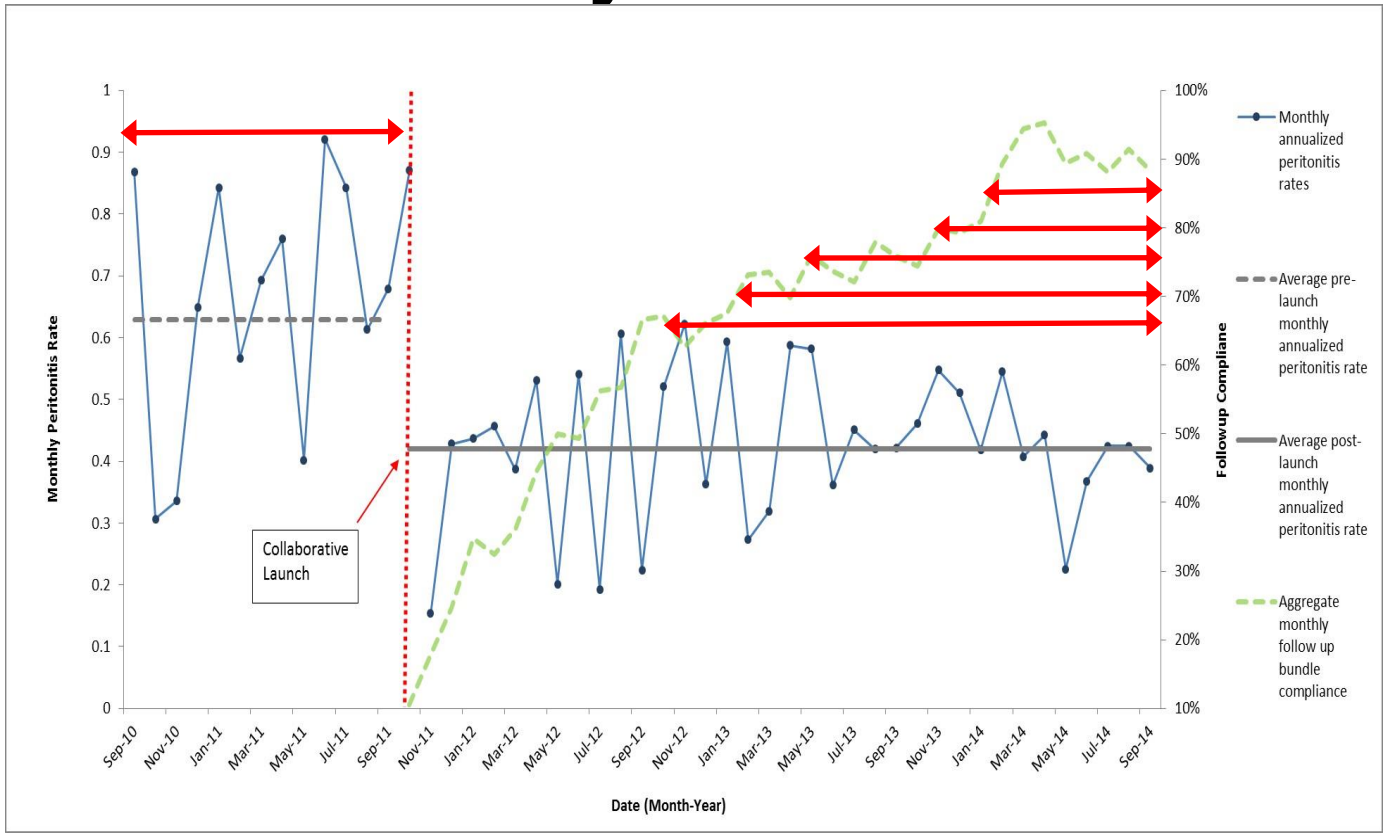
Mean Monthly Peritonitis Rates

	Mean	95% CI	P-Value
Pre-Launch	0.63	(0.43, 0.92)	0.026
Post-Launch	0.42	(0.31, 0.57)	

Modeled using GLMM techniques assuming a negative binomial distribution with a natural log link function. Covariates in the model included a pre-launch slope effect, a post- launch slope effect and an effect to capture any change in model intercept between the pre-launch and post-launch periods. A random effect for center was included in these models to accommodate center-specific variability in peritonitis rates.

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Mean Monthly Peritonitis Rates



Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Sensitivity Analysis

Follow Up Compliance %	Month/Year Mean Compliance Achieved	# Months to Mean Collaborative Compliance	Ratio of Peritonitis Rates (95% CI)	p-value
65%	November 2012	13	1.23 (0.86,1.77)	0.311
70%	March 2013	17	1.27 0.89,1.78)	0.168
75%	July 2013	21	1.37 (0.95, 1.96)	0.086
80%	November 2013	25	1.42 (1.01,1.99)	0.045
85%	March 2014	29	1.65 (1.17, 2.34)	0.007

Neu et al. *Kidney International*, 89(6):1346-54, 2016.

Objective

- Describe the peritonitis rates in the first 6 years of the SCOPE Peritonitis Project

Methods

- Pre: September 1, 2010-September 30, 2011
- Post: October 1, 2011-August 31,2017

- Infection rates for each center were calculated as an annualized rate =

$$\frac{\text{Number of infections during time period}}{\text{Peritoneal dialysis patient-years at risk}}$$

- Collaborative rates were calculated as the mean of the center rates

Methods

Current SCOPE Participants

43 Centers

Participating at Collaborative Launch October 2011

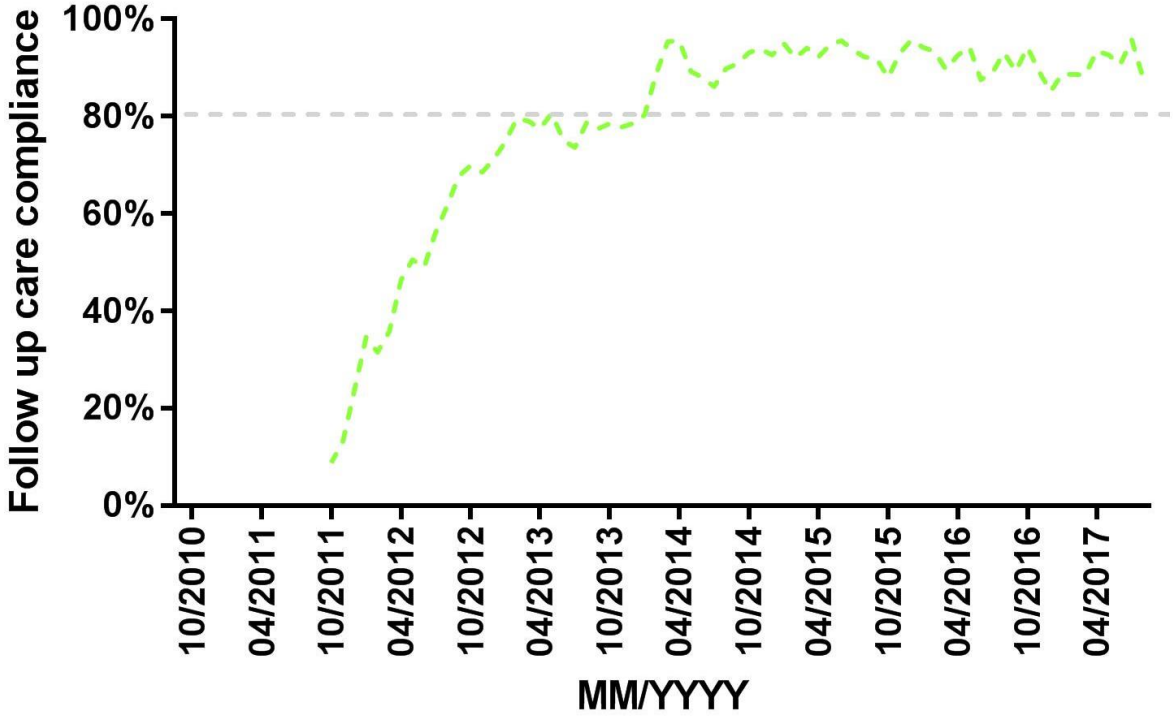
29 Centers

Provided pre-launch patient and infection data

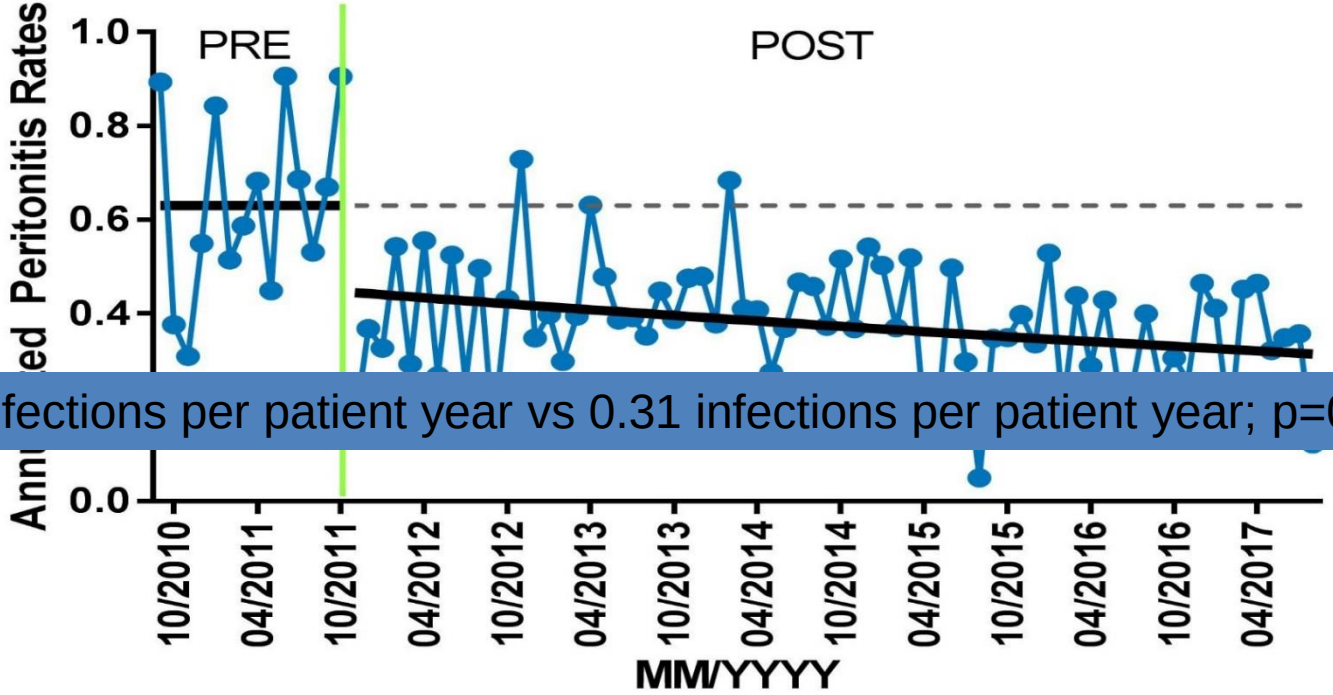
20 Centers

748 patients
11,174 follow up forms

Compliance with Follow Up Bundle

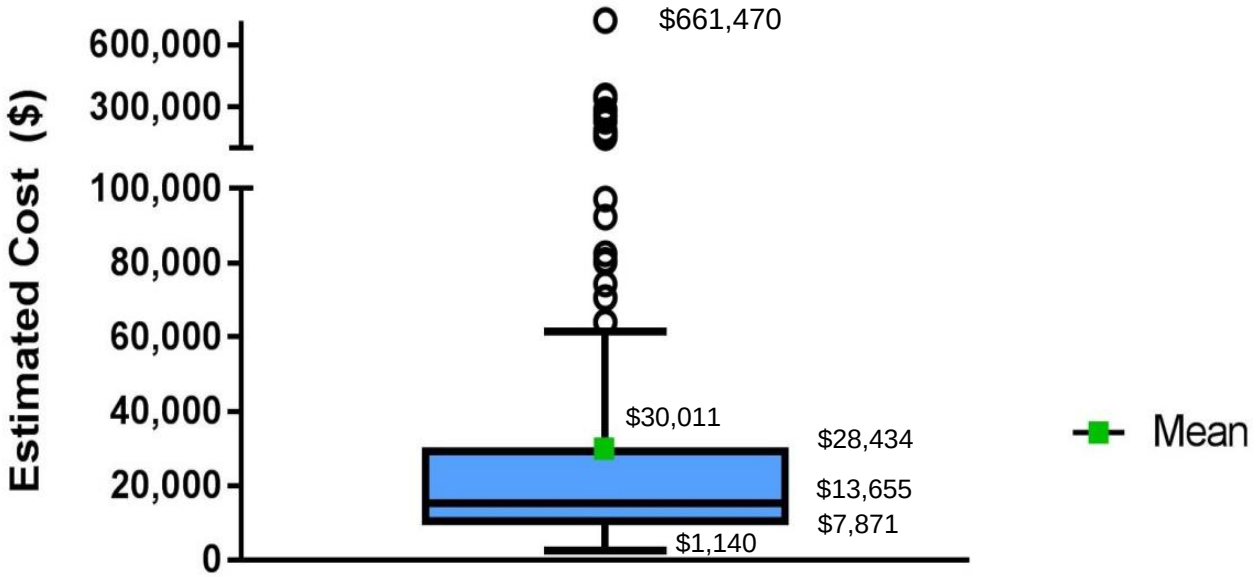


SCOPE Peritonitis Rates



0.44 infections per patient year vs 0.31 infections per patient year; p=0.031

Estimated 487 infections and 301 hospitalizations prevented
$9,036,772 in cost savings



Conclusions

- SCOPE centers significantly increased implementation of standardized follow up care practices and demonstrated a significant reduction in monthly peritonitis rates
- Ongoing efforts focus on maintaining compliance with follow up care, refining care practices included in the bundles, and identifying other modifiable risk factors for peritonitis

SCOPE Participating Centers

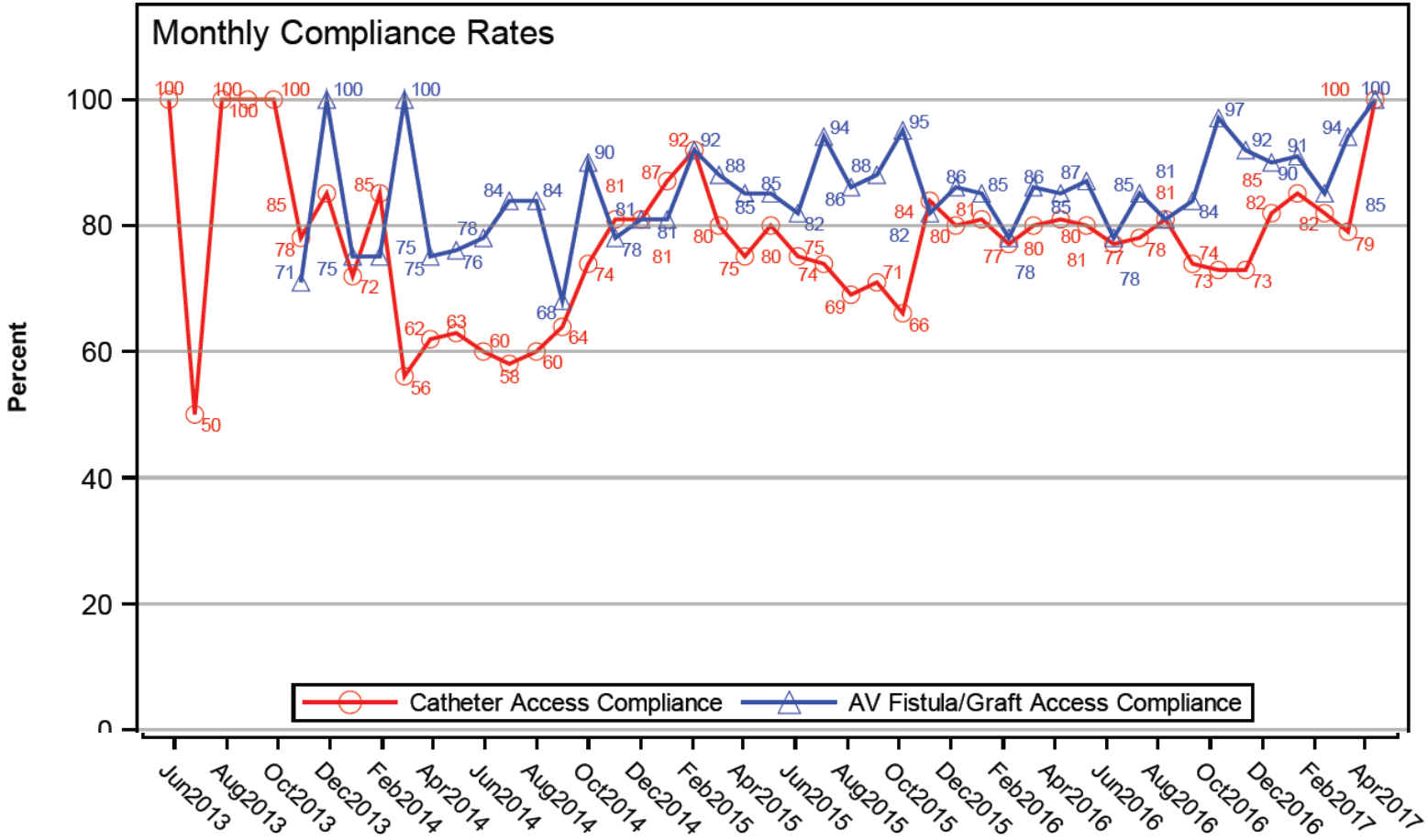
Alfred I duPont Hospital for Children: Joshua Zaritsky, Kim LaSalvia	**American Family Children's Hospital:** Allison Redpath Mahon, Dawn Foster	**Ann & Robert H. Lurie Children's Hospital of Chicago:** Mahima Keswani, Nancy Majkowski	**Arkansas Children's Hospital:** Richard Blaszak, Christine Blaszak	**Arnold Palmer Hospital for Children:** Jorge Ramirez, Barbara Cometti
Boston Children's Hospital: Michael Somers, Theresa Pak	**Children's Hospital Los Angeles:** Rachel Lestz, Alice Sanchez	**Children's Hospital Medical Center of Akron:** Shefali Mahesh, Julie Mate	**Children's Hospital of Wisconsin:** Raji Sreedharan, Jackie Dake	**Children's Medical Center Dallas:** Raymond Quigley, Haridas Thankappan
Children's Mercy Hospitals and Clinics: Brad Warady, JoLynn Grimes	**Children's National Medical Center:** Kirtida Mistry, Jennifer Carver	**Cincinnati Children's Hospital Medical Center:** Donna Claes, Charles Coe II	**Cleveland Clinic:** Raed Bou Matar, Elizabeth Strang	**Children's Hospital Colorado:** Elizabeth Salvia, Terri Bisio
Connecticut Children's Hospital: Cynthia D'Allesandri-Silva, Carol Miller	**Cook Children's Medical Center:** Badreldin Bedri, Antoinette Thomas	**Dell Children's Medical Center of Central Texas:** Kartik Pillutla, Lauren Clements	**Driscoll Children's Hospital:** Samhar Al-Akash, Britt Stone	**James and Connie Maynard Children's Hospital:** Guillermo Hidalgo, Malinda Harrington
Johns Hopkins Children's Center: Alicia Neu, Barbara Case	**Levine Children's Hospital:** Donald Weaver, Christy Leyland	**Lucile Packard Children's Hospital:** Cynthia Wong, Michelle Espiritu	**Mattel Children's Hospital UCLA:** Isidro Salusky, Barbara Gales	**MUSC Children's Hospital:** Katherine Twombley, Karen Hiott
Nationwide Children's Hospital: Rose Ayoob, Beth Smith	**Phoenix Children's Hospital:** Kanwal Kher, Cassandra Smith-Fields	**Primary Children's Hospital:** Raoul Nelson, Dan Hansgen	**Seattle Children's Hospital:** Coral Hanevold, Nancy McAfee	**SSM Cardinal Glennon:** Anne Beck, Jacque Tanquary
St. Louis Children's Hospital: Keefe Davis, Monica Hughey	**Steven and Alexandra Cohen Children's Medical Center:** Christine Sethna, Myung Cho	**Texas Children's Hospital:** Sarah Swartz, Helen Currier	**The Children's Hospital at Montefiore:** Anna Zolotnitskaya, Cheryl Fried	**The Children's Hospital at OU Medical Center:** Pascale Lane, Kristi Booker
The Children's of Alabama: Sahar Fathallah-Shaykh, Jessica Stephenson	**The Children's Hospital of Philadelphia:** Stephanie Clark, Chris Breen	**UCSF Benioff Children's Hospital:** Marsha Lee, Audrey Busch	**University of Iowa Stead Family Children's Hospital:** Kathy Lee-Son, Jennifer Ehrlich	**Yale-New Haven Children's Hospital:** Olivera Marsenic Couloures, Linda Anderson

Thanks to all the children on PD and their families

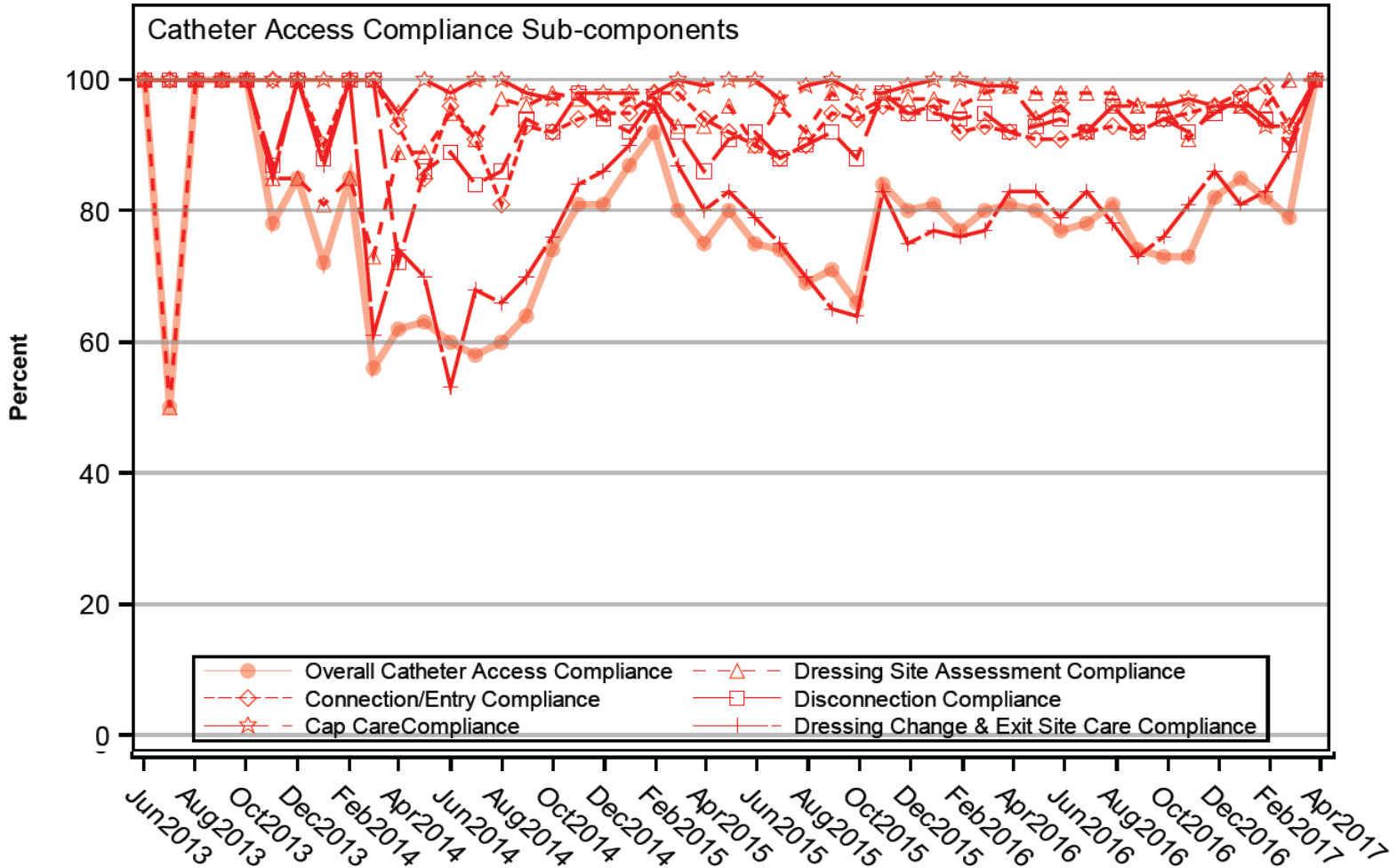
JOHNS HOPKINS
CHILDREN'S CENTER

Thank you!

Aggregate Monthly Compliance



Aggregate Monthly Sub-component Compliance-Catheter

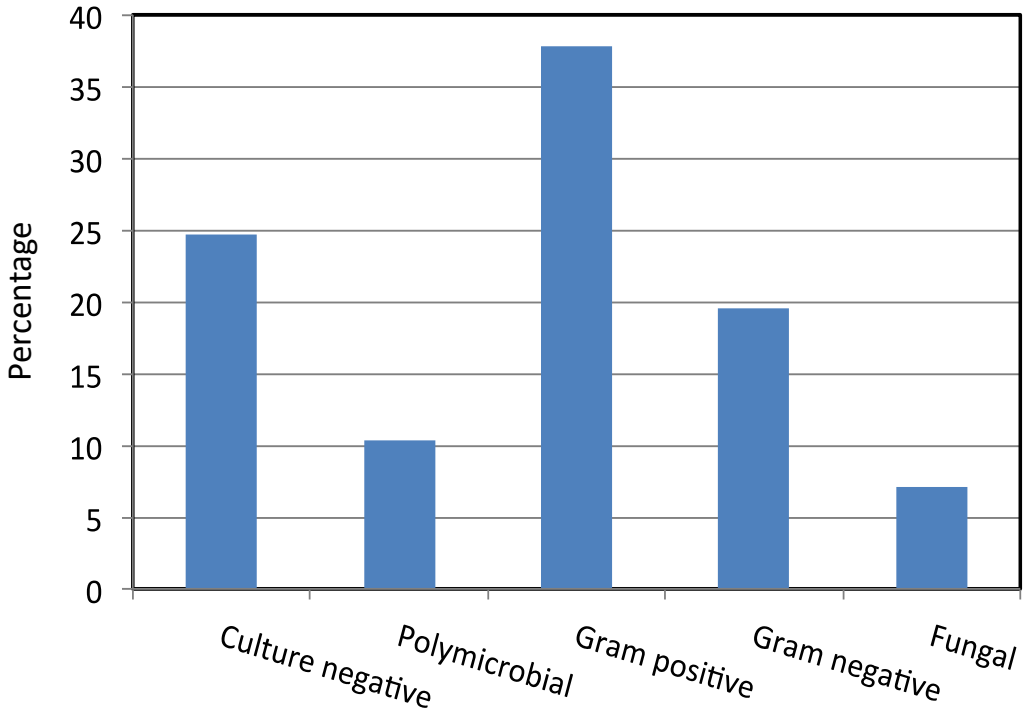


SCOPE Research and Innovation Groups

- Fungal Peritonitis (Raj Munshi)
- Culture Negative Peritonitis (Kris Bryant)
- Training Practices (Nancy McAfee)
- Touch Contamination (Barbara Case)
- Home Visit (Janet McDonald)
- Prophylactic Antibiotics/antifungal (Raj Munshi)

Peritonitis Cultures

N= 391 episodes
N= 389 cultures



Sethna C, et al CJASN 11:1580-1596, 2016

Training Compliance

Table 4. Catheter Outcomes	Total	ISPD All-or-None Non Compliant	ISPD All-or-None Compliant	p-value
N, Trainings	473	369	104	
Peritonitis within 6 months of insertion, N (%)	73 (15.4)	52 (14.1)	21 (20.2)	0.128
# Touch Contaminations Reported within 6 months of insertion, N(%)				0.029
0	374 (88.0)	286 (86.1)	88 (94.6)	
1	39 (9.2)	37 (11.1)	2 (2.2)	
2+	12 (2.8)	9 (2.7)	3 (3.2)	
Terminated, N(%)	302 (63.8)	232 (62.9)	70 (67.3)	0.406
Days to Termination, Median (IQR)	311 (180, 533)	305 (162, 528.5)	345.5 (213, 607)	0.13

PD Catheter Insertion Bundle

- Catheter exit-site orientation in the lateral or downward position
- IV 1st generation cephalosporin x 1 dose <u>prior</u> to incision
- No sutures at exit site
- Post-op
  - Catheter immobilized
  - No dressing changes in 1st 7 days and then only sterile (gown, mask, gloves) dressing changes until exit site healed
  - No catheter use for 14 days

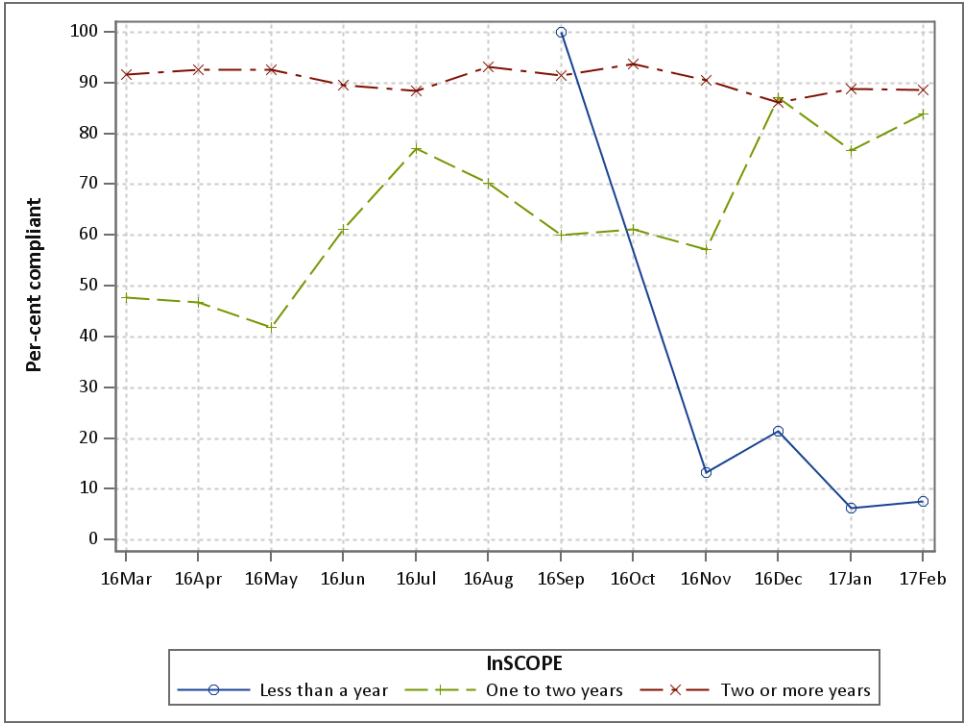
Patient and Care Giver Training Bundle

- Training performed by qualified RN
- Training RN to pt/family ratio 1:1
- Primary provider & alternate for each patient
- Appropriate teaching aids
- Unit training protocols based upon ISPD guidelines
- Specific protocols for aseptic technique, WHO hand hygiene, exit site care
- Post-training concept test & demo test
- Home visit

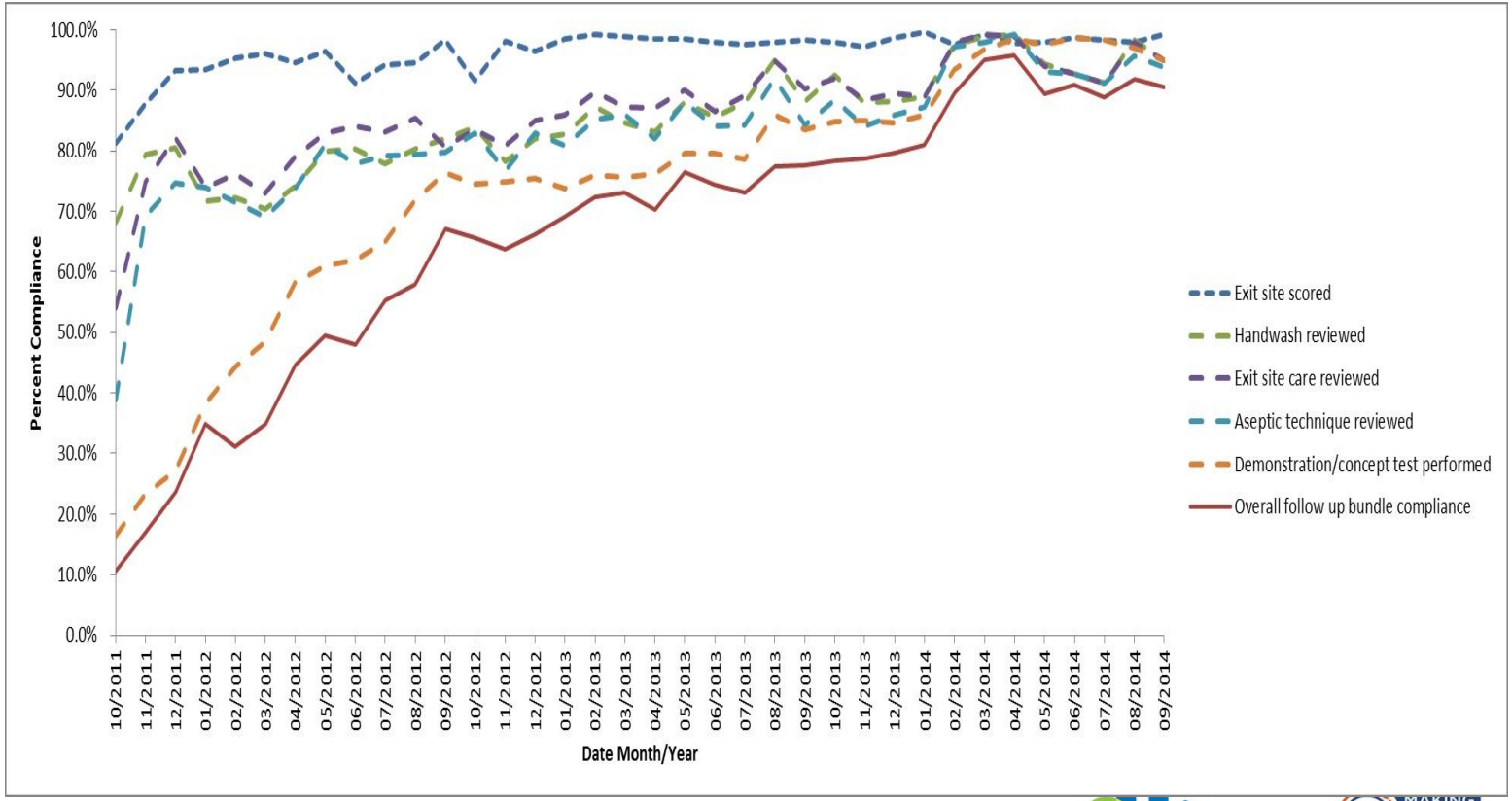
PD Catheter/Exit Site Follow-Up Care Bundle

- **Monthly visit**
  - Exit-site scored by RN (IPPN scoring)
  - Key aspects of hand hygiene, exit site care and aseptic technique reviewed
- **Every 6 month demo test and concept test**
- **Re-training after peritonitis episode**
- **Prophylactic antibiotics with touch contamination or other break in aseptic technique according to ISPD guidelines**

PD FU YE Feb 2017: FU Overall



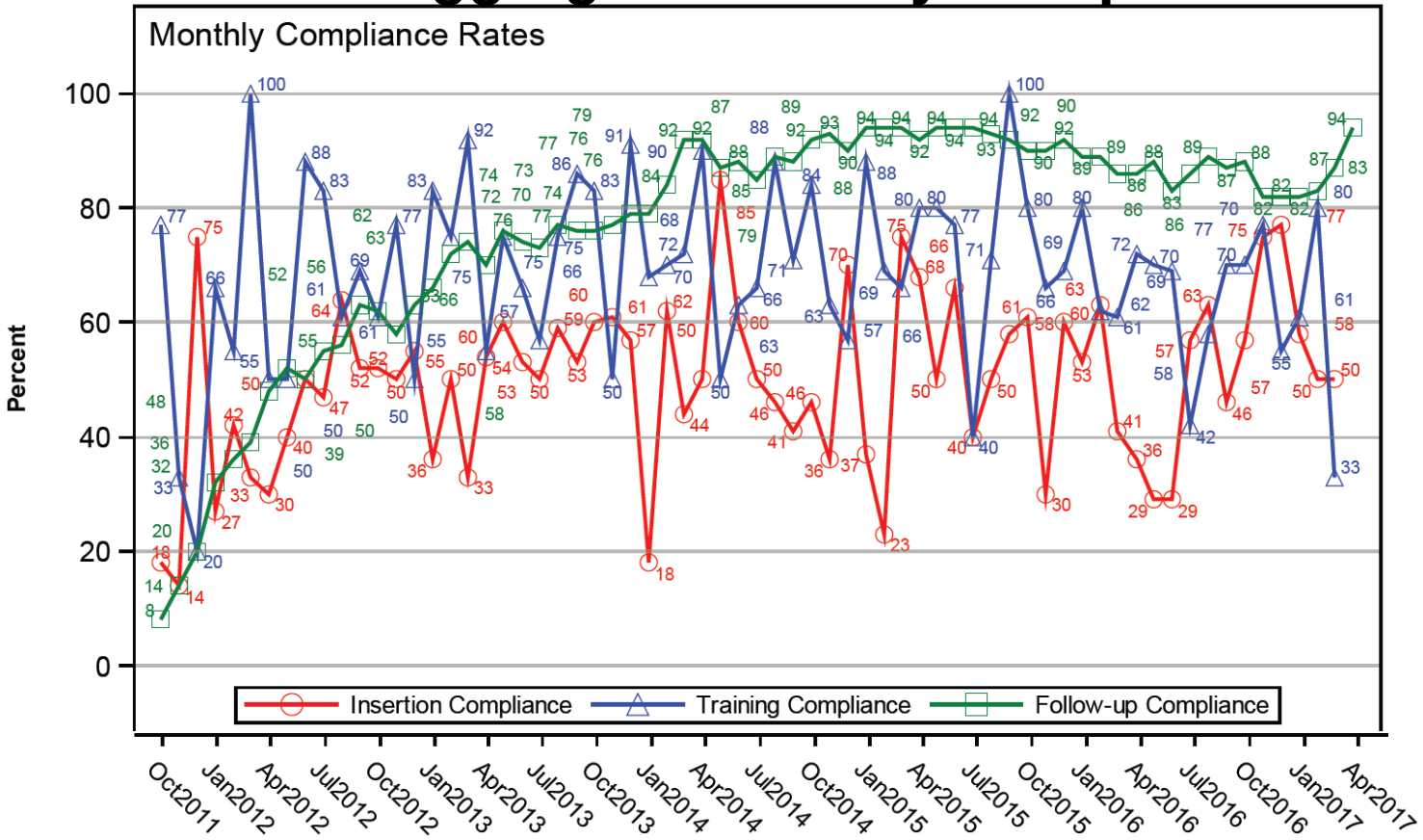
Follow up Bundle Compliance



PD Project
Enrollment/Data (May 15, 2017)

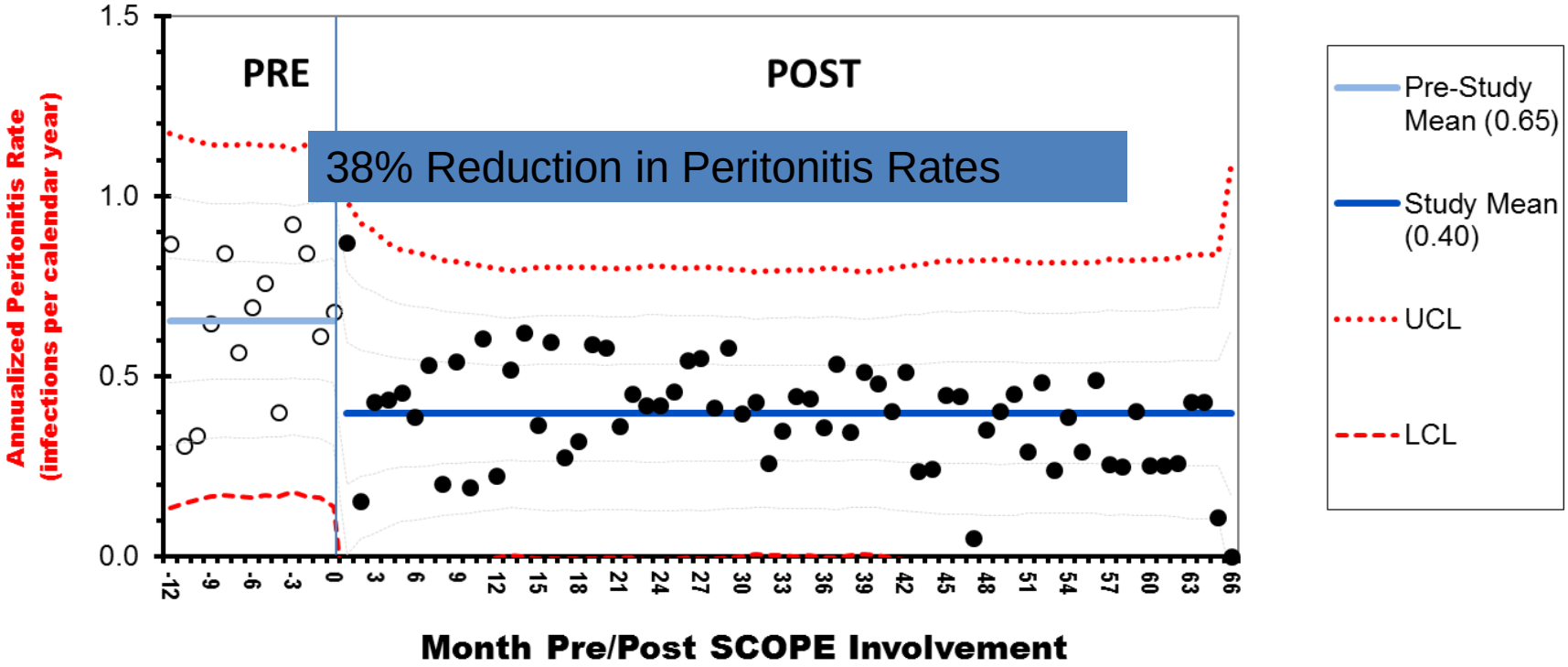
- 1415 enrollments, 1031 terminations
- 1261 Catheter Insertion
- 1290 Training Sessions
- 17662 Follow Up Forms
- 974 Infections over 20075.45 catheter-months of follow up
  - 698 Peritonitis episodes
  - 276 Exit site/tunnel infections

Aggregate Monthly Compliance



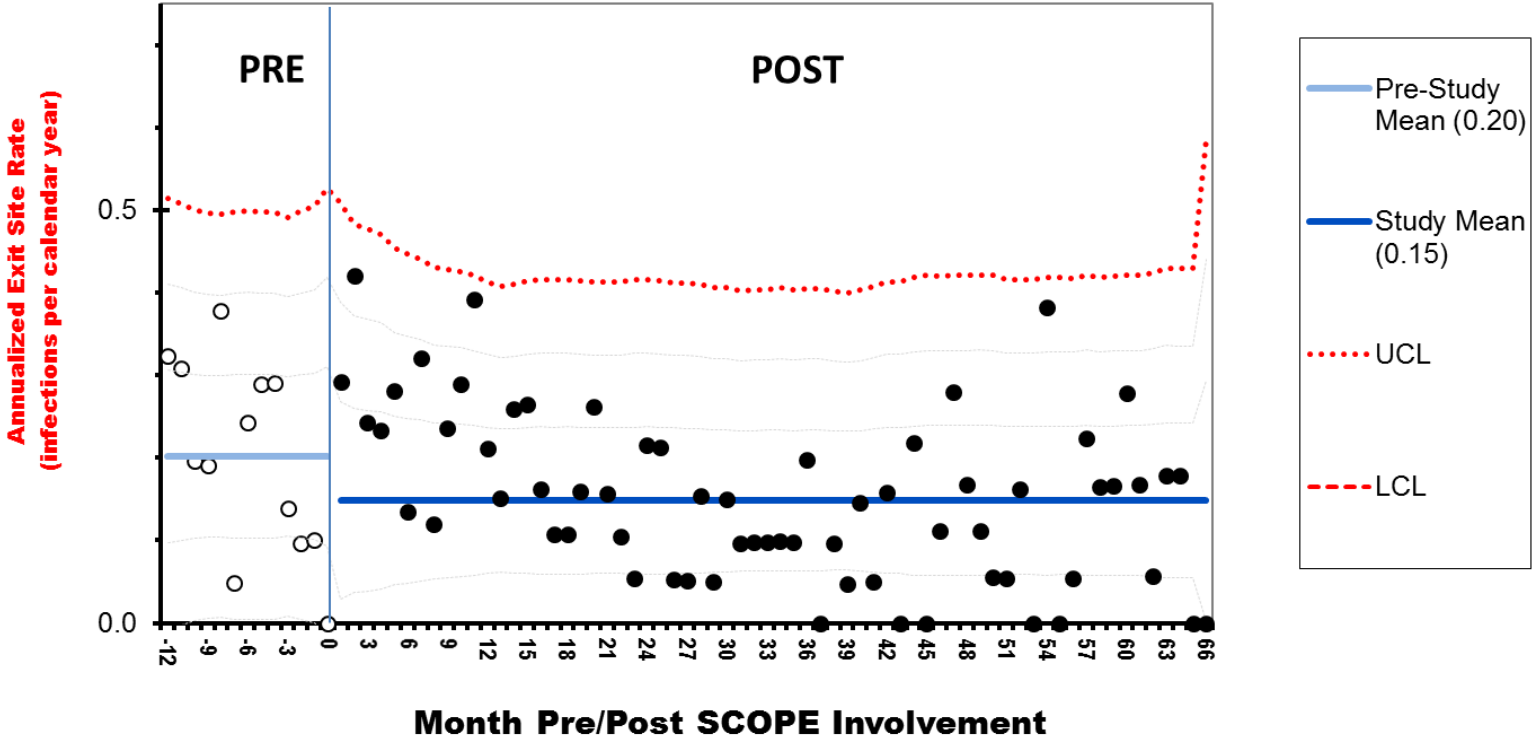
Annualized Peritonitis Rate by Month: Pre- thru 66 Months Post

N=24 Centers with Pre/Post Data, Excluding Hospitalizations

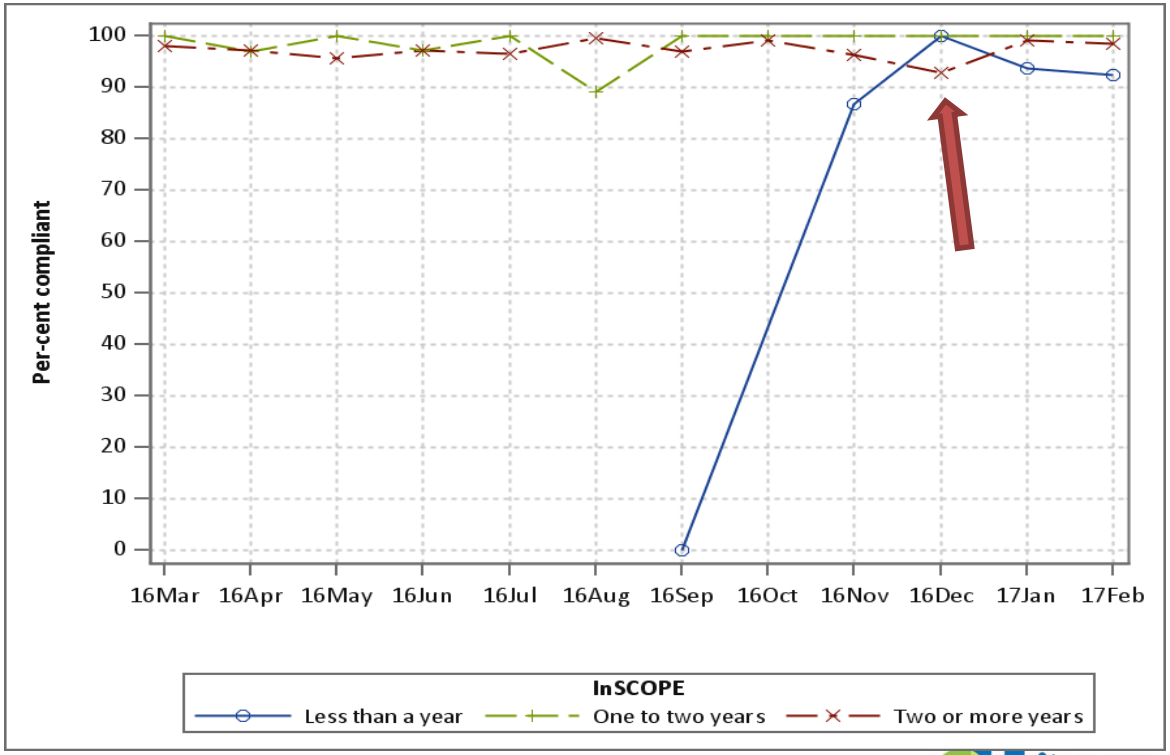


Annualized Exit Site Rate by Month: Pre- thru 66 Months Post

N=22 Centers with Pre/Post Data, Excluding Hospitalizations



PD FU YE Feb 2017: Exit site scored by RN

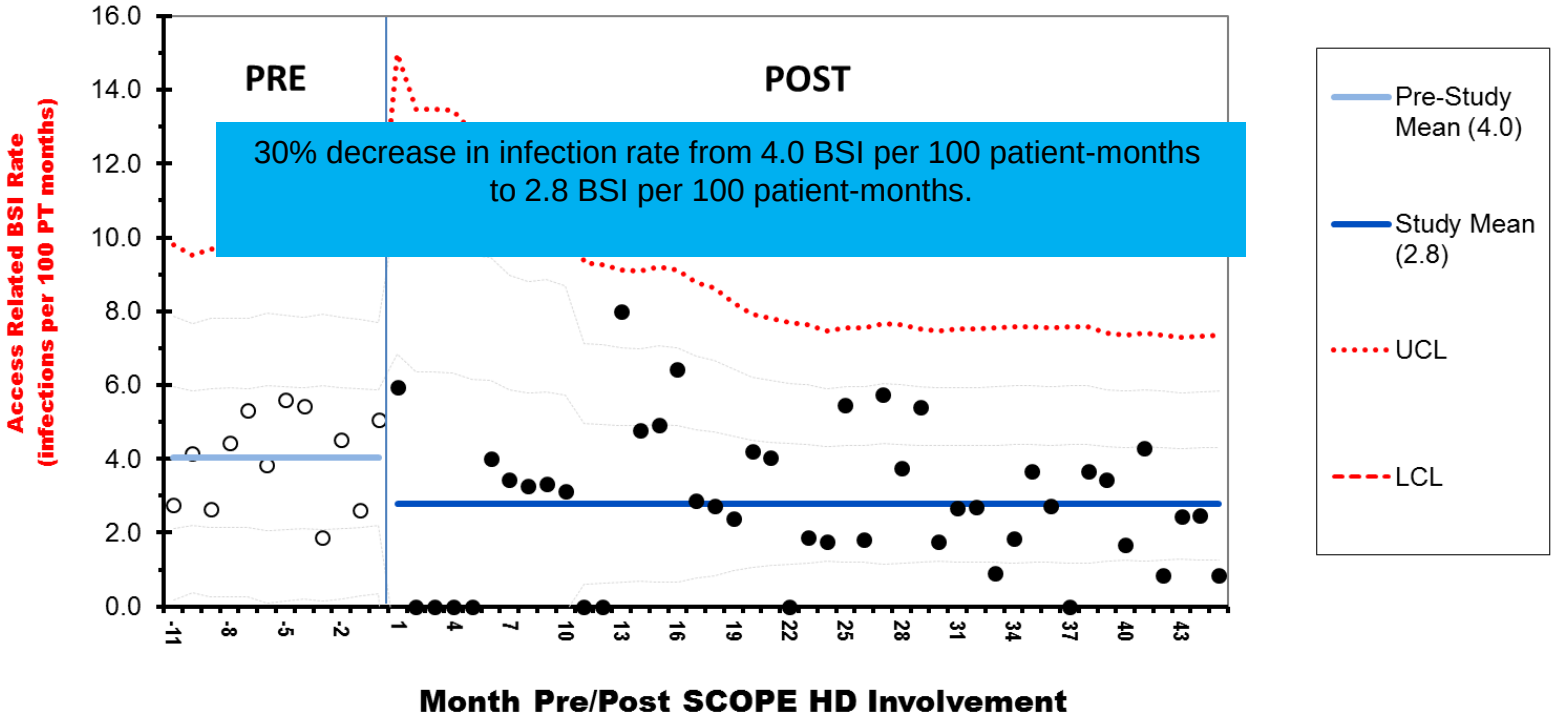


Impact Data

- ***38%*** **reduction in peritonitis rates**
- ***25%*** **reduction in ES infections**
- **Estimated *388.7* infections prevented**
- **Observed Hospitalization Rate FOR peritonitis: *61.8%***
- **Estimated *240* hospitalizations prevented**

Access Related BSI Rate by Month: Pre- thru 34 Months Post

N=15 Centers with Pre/Post Data

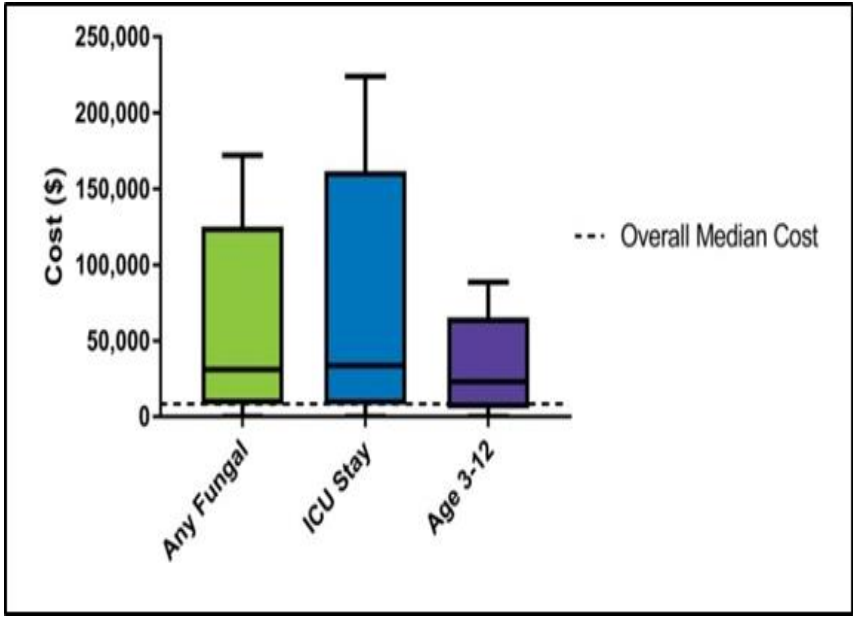


Cost of Hospitalization

- Peritonitis episodes prospectively reported by 24 of 29 SCOPE centers between 10/2011 and 9/2015.
- SCOPE peritonitis episodes linked with administrative and billing hospitalization data in the Pediatric Health Information System (PHIS) database Month of birth
- Exclusions:
  - Exit site/tunnel infections; Peritonitis episodes at non-PHIS participating centers; Peritonitis episodes occurring during hospitalization more than 48 hours after admission.
- Outcome:
  - Wage-adjusted hospitalization charges converted to estimated costs using hospital-specific ratio of costs-to-charges.
- Analysis:
  - Peritonitis episodes in the lower 75% by cost compared with upper 25% using a chi-square test of association (categorical data) or Wilcoxon rank-sum test (continuous data).

Cost of Hospitalization

Result

- 553 Peritonitis infections in SCOPE; 494 reported by PHIS participating centers.
- 266 Peritonitis episodes (54%) linked with 278 PHIS hospitalizations
- Hospitalization cost per episode:
  - Median (IQR): $13,655 ($7871,$28434)
  - Mean (SE): $30,011 ($3,549)
- Factors associated with high cost hospitalizations: age 3-12 years, Hispanic race, fungal infection, and ICU stay

Cost distribution of factors contributing to high cost hospitalization for treatment of Peritonitis