Implementation of standardized follow-up care significantly reduces peritonitis in children on chronic peritoneal dialysis

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The Standardizing Care to improve Outcomes in Pediatric End stage renal disease (SCOPE) Collaborative aims to reduce peritonitis rates in pediatric chronic peritoneal dialysis patients by increasing implementation of standardized care practices. To assess this, monthly care bundle compliance and annualized monthly peritonitis rates were evaluated from 24 SCOPE centers that were participating at collaborative launch and that provided peritonitis rates for the 13 months prior to launch. Changes in bundle compliance were assessed using either a logistic regression model or a generalized linear mixed model. Changes in average annualized peritonitis rates over time were illustrated using the latter model. In the first 36 months of the collaborative, 644 patients with 7977 follow-up encounters were included. The likelihood of compliance with follow-up care practices increased significantly (odds ratio 1.15, 95% confidence interval 1.10, 1.19). Mean monthly peritonitis rates significantly decreased from 0.63 episodes per patient year (95% confidence interval 0.43, 0.92) prelaunch to 0.42 (95% confidence interval 0.31, 0.57) at 36 months postlaunch. A sensitivity analysis confirmed that as mean follow-up compliance increased, peritonitis rates decreased, reaching statistical significance at 80% at which point the prelaunch rate was 42% higher than the rate in the months following achievement of 80% compliance. In its first 3 years, the SCOPE Collaborative has increased the implementation of standardized follow-up care and demonstrated a significant reduction in average monthly peritonitis rates.

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Peritoneal dialysis (PD) catheter-related infections are a significant complication of chronic PD, and peritonitis is a leading cause of hospitalization, termination of PD, and death among children on chronic PD.[1–6] Although internationally developed guidelines for the prevention and treatment of PD catheter-related infections include recommendations for patient/caregiver training and PD catheter care, variation in the application of these guidelines likely exists.[7] Operating under the hypothesis that more uniform implementation of PD catheter care practices will lead to a reduction in peritonitis rates, the Standardizing Care to improve Outcomes in Pediatric End stage renal disease (SCOPE) Collaborative was launched in 2011.[8] This quality transformation collaborative effort uses a model characterized by collaboration combined with rigorous quality improvement methodologies and real-time, transparent reporting of process and outcome metrics.[8] This model has been highly successful in reducing catheter-associated bloodstream infections in the hospital and ambulatory clinic settings.[9–13] The SCOPE Collaborative expands this infection prevention effort to the home, where the patient and/or family performs the dialysis procedure. This manuscript describes the results of the first 3 years of the SCOPE Collaborative, with a focus on the rates of compliance with standardized care bundles and peritonitis rates among centers for whom prelaunch infection rates were available.

RESULTS

Twenty-four of 29 SCOPE centers participating at the collaborative launch and providing pre-collaborative launch infections rates and patient counts were included in the analysis. Among these centers, 644 patients were enrolled on whom 751 peritoneal dialysis catheter insertions, 319 initial training sessions, and 7977 follow-up encounters were included between the collaborative launch on October 1, 2011 and September 30, 2014. Table 1 shows the demographic characteristics of this cohort, which did not differ significantly from the cohort derived from all 29 SCOPE centers (data not shown). Median patient age at enrollment for the 24-center cohort was 9 years (interquartile range: 1, 15). Median patient age at enrollment by center was 8.8 years (interquartile range: 4.5, 13). Demographic data from the prelaunch cohort

Table 1 | Demographics of 644 patients enrolled from 24 of 29 centers in first 36 months of the Standardizing Care to improve Outcomes in Pediatric End stage renal disease (SCOPE) Collaborative

Demographic characteristic	N	Percent
Age at enrollment		
0–1 years	184	28.57
2–5 years	79	12.27
6–12 years	130	20.19
13–17 years	206	31.99
18+ years	45	6.99
Sex		
Male	345	53.57
Female	299	46.43
Race		
White	297	46.12
Black	115	17.86
Hispanic	167	25.93
Other	65	10.09
Cause of end-stage kidney disease		
Congenital anomalies of the kidney and urinary tract	246	38.2
Glomerulonephritis	82	12.73
Polycystic kidney disease	37	5.75
Focal and segmental glomerulosclerosis	85	13.2
Cystic disease/Ciliopathy	23	3.57
Cortical necrosis	26	4.04
Other	145	22.52

Table 2 | Comparison of demographic characteristics of prelaunch and postlaunch cohort from 18 centers that provided prelaunch data

Demographic characteristic	Prelaunch (N = 229)	Postlaunch (N = 428)	*P* value
Center median age (years [quartile 1, quartile 3])	7.5 (4, 11)	9.75 (7, 11)	0.81
Individual patient age median age (years [quartile 1, quartile 3])	11 (1, 15)	9 (1, 14)	0.05
	N (%)	N (%)	*P* value
Age at enrollment			0.62
0–1 years	57 (24.9)	128 (29.9)	
2–5 years	21 (9.2)	47 (11.0)	
6–12 years	52 (22.7)	95 (22.2)	
13–17 years	88 (38.4)	138 (32.2)	
18+ years	9 (3.9)	17 (4.0)	
Race			0.76
White	109 (47.6)	214 (50.0)	
Black	50 (21.8)	76 (17.8)	
Hispanic	49 (21.4)	96 (22.4)	
Other	20 (8.7)	41 (9.6)	
Sex			0.89
Female	104 (45.4)	198 (46.3)	
Cause of end-stage renal disease			0.12
Congenital anomalies of the kidney and urinary tract	75 (32.8)	156 (36.4)	
Glomerulonephritis	26 (11.4)	50 (11.7)	
Polycystic kidney disease	16 (7.0)	20 (4.7)	
Focal and segmental glomerulosclerosis	29 (12.7)	48 (11.2)	
Cystic disease/Ciliopathy	4 (1.7)	17 (4.0)	
Cortical necrosis	2 (0.9)	15 (3.5)	
Other	76 (33.2)	122 (28.5)	

were provided by 18 of the 24 centers. A comparison of the demographics of the 229 patients in the prelaunch and 428 patients in the postlaunch cohorts from these 18 centers revealed that the median patient age in the prelaunch cohort was slightly higher than postlaunch, but median age by center was not different (Table 2). There was no significant difference in the age distribution, race, sex, or cause of end-stage renal disease between the 2 cohorts (Table 2).

Figure 1 reveals the overall mean monthly compliance with the follow-up care bundle over the first 36 months of the collaborative. The likelihood of compliance with the bundle increased significantly over this time period (odds ratio [OR] 1.15, 95% confidence interval [CI] 1.10, 1.19; $P < 0.001$) (Figure 1). Figure 1 also shows compliance with each of the mandatory sub-components of the follow-up bundle: scoring of the exit-site using the International Pediatric Peritoneal Dialysis Network scoring tool, review of hand hygiene, review of exit-site care, review of aseptic technique, and completion of a demonstration and concept test in the previous 6 months (Table 3).[8,14] Notably, compliance with scoring of the exit-site by the dialysis nurse exceeded 80% within the first month of the launch. When considered separately, compliance with each of the required reviews of hand hygiene, exit-site, care and aseptic technique increased to approximately 80% by 12 months postlaunch. Mean monthly compliance with evaluating patient/caregiver ability to perform the dialysis procedure using a concept and demonstration test increased more gradually, reaching 80% between 1 and 2 years postlaunch (Figure 1). Overall compliance, which requires that all components be completed during a single follow-up encounter, did not reach 80% until the fall of 2013, 2 years after collaborative launch.

Aggregate monthly compliance with the catheter insertion bundle over time is shown in Figure 2. The likelihood of compliance with the bundle did not significantly increase over the first 36 months of the collaborative (OR 1.02, 95% CI 0.99, 1.04, $P = 0.064$). Similarly, the likelihood of compliance with the training bundle did not increase significantly over this time period (OR 1.02, 95% CI 0.99, 1.05, $P = 0.105$) (Figure 3). Figure 2 also details mean compliance with each of the care components included in the insertion bundle. Compliance with a single component, use of the PD catheter less than 14 days after catheter insertion, was responsible for the lower overall bundle compliance (Figure 2). Similarly, the low overall compliance with the training bundle was closely associated with low compliance with performance of a home visit (Figure 3). Compliance with all other training bundle components was over 80% within a few months of the collaborative launch.

Two hundred-six peritonitis episodes over 3778 patient months were reported by the 24 centers during the 13-month prelaunch period. These same centers reported 320 peritonitis episodes over 8853 patient months during the first 3 years of the collaborative. The 24 centers reported 59 and 128 exit site/tunnel infections in the pre- and postlaunch period,