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ORIGINAL ARTICLE

Long-term outcomes of antegrade continence enema in children with chronic encopresis and incontinence: what is the optimal flush to use?

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Abstract

Purpose Severe constipation and encopresis are significant problems in the pediatric population. Medical management succeeds in 50–70%; however, surgical considerations are necessary for the remainder such as the antegrade continence enema (ACE). The purpose of this study is to assess the long-term outcomes following the ACE procedure.

Methods All patients undergoing an ACE over a 14-year period were included. Data on clinical conditions, treatments, and outcomes were collected. A successful outcome was defined as remaining clean with ≤ 1 accident per week. Comparative data were analyzed using the Fisher's exact test, Mann–Whitney *U* test, or Student's *t* test.

Results There were 42 ACE patients, and overall, 79% had improvement in their bowel regimens. Encopresis rates decreased from 79 to 5% ($P < 0.001$). Admissions for cleanouts decreased from 52 to 19% ($P = 0.003$). All cases of Hirschsprung's, functional constipation and spina bifida were successful. Rates of success varied for other diseases such as slow-transit constipation (60%) and cerebral palsy (33%). A majority (85%) required a change in the enema composition for improvement.

Conclusion In our study, ACE reduced soiling, constipation, and need for fecal disimpaction. Higher volume saline flushes used once a day was the optimal solution and most preferred option.

Level of evidence Level 4 (retrospective case series or cohort).

Keywords Constipation · Antegrade enema · Hirschsprungs · Encopresis · Incontinence

Introduction

Fecal incontinence, or encopresis, and constipation are common gastrointestinal problems. Fecal incontinence may be secondary to fecal impaction, where liquid stool overflows around the fecal mass, and affects 1–2% of pediatric patients [1, 2]. Prevalence of childhood constipation is estimated at up to 30%. Greater than 3% of general pediatric clinic visits are related to constipation [1]. Pediatric patients with fecal incontinence or constipation have been found to have lower health-related quality of life scores in physical, social, emotional, and school functioning [3]. There is significant social stigma related to fecal soiling, which can result in low self-esteem, social isolation, and emotional difficulties [4]. Medical intervention is sought to correct symptoms and ultimately improve patients' social and emotional well-being. Medical and behavioral interventions have been found to improve symptoms in 50–70% of pediatric patients [2, 5].

Surgical options should be considered in pediatric patients with medically refractory constipation, medically refractory encopresis, anorectal malformations, Hirschsprung disease, or spinal abnormalities [6]. The antegrade continence enema (also known as antegrade colonic enema or ACE) was developed by Malone in 1990 to manage refractory constipation or fecal incontinence in children who would have otherwise been treated with a colostomy for fecal diversion [7]. The ACE procedure can be performed open or laparoscopically, with the latter being more common [6]. A catheter is placed within the appendix, cecum, or ileum, and remains in place continuously to provide a conduit for antegrade colonic irrigation [8]. Children undergo bowel cleanout through the administration of saline, polyethylene glycol, or glycerin and saline antegrade enemas, with adjustments in frequency

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and volume according to patient's symptoms. These colonic washouts lead to decreased rates of fecal soiling and/or constipation by allowing for appropriate control of bowel movements [9]. Several centers have reported success rates from 57 to 97%, with success variably defined as partial or complete fecal continence [4, 9, 10].

There are a few studies that have evaluated the long-term outcomes after an ACE procedure. One such study by Dolejs et al. reported long-term outcomes of patients with fecal incontinence who underwent the ACE procedure. They noted excellent response rates (95%), but also a high incidence of complications (55%) after 26 ± 41 months of clinical follow-up. These included leaking stoma, painful flushing, fecal impaction, ACE prolapse, and surgical site infection [11]. Another study found a long-term success rate of 78% with median ACE duration of 77 months as well as a lower rate of complications (36%) and reintervention (8.4%) [12]. Despite its efficacy, the high long-term morbidity associated with the ACE procedure is concerning and merits further investigation. The primary aim of this report is to understand the long-term clinical outcomes following the ACE procedure. This was measured by the effectiveness of the procedure in reducing symptoms, defined as "success" or "failure". Secondary aims include patient demographics, inpatient clinical outcomes, optimal type and frequency of flushes, and subjective changes in quality of life for caregivers.

Methods

Patient selection and data collection

With approval of the institutional review board (IRB) at the University of Florida, a retrospective chart review of electronic medical records was conducted on children who underwent either a laparoscopic or open ACE procedure at our institution from 1999 to 2013. Cases were identified with a departmental as well as a hospital database using ICD-9 and CPT codes, and cross-referenced with electronic medical records. Pre-operative data included demographic information such as age, sex, race, year of surgery, and insurance status. Pre-operative clinical variables included comorbidities, history of encopresis or constipation, duration of symptoms, soiling habits, history of admission for bowel cleanout, diagnostic imaging, medical history, medication regimen, and indications for ACE procedure. Operative data included operative technique (laparoscopic versus open), operative duration, procedure setting (inpatient versus outpatient), cecostomy tube type, and any additional procedures performed during the index procedure. Immediate post-operative data included length of stay, short-term complications (defined as those occurring during hospital stay or within 2 weeks of discharge), and medications. Long-term follow-up data included flushing regimen (volume, frequency, type of solution, and change in flush regimen), outpatient clinic visits, soiling habits, duration of ACE, subsequent admissions for bowel cleanout, replacement of tube, surgical reintervention, conversion to intermittent catheterization, tube removal, and any other concerns voiced by caregivers.

A "successful outcome" was defined as a patient who continued to use the ACE with no further issues with constipation and ≤ 1 episode of soiling per week or adequate reduction of symptoms to stop using the ACE entirely. This definition included patients who had a substantial reduction in soiling and improvement in the number of bowel movements per week, as well as those who had complete resolution of encopresis, with a daily bowel movement. "Failure" was defined as an inability to improve the fecal soiling or constipation, even if there was an initial response. Patients were classified as "success" or "failure" independently of the presence or absence of post-operative complications.

Phone survey

Our institutional IRB approval also included a long-term follow-up phone call survey. Patients were excluded if they did not agree to answer questions, did not answer after four separate attempts, or had moved or changed their numbers with no updated contact information. Patient contact information was obtained from electronic medical records and a departmental database. To obtain consent, letters were mailed to participants 2 weeks prior to the phone call to explain the purpose of the study, research benefits and risks, voluntary participation, and a statement of confidentiality. In the event of non-availability, contact was attempted three more times at different times and days. The parents were asked to answer questions for minors. If the subject was greater than 18 years of age, the patient or parent was asked to answer the survey questions. All callers utilized a pre-defined script when contacting all patients. Parents were allowed to opt out of the phone survey at any time. The survey was tested and refined using volunteers from the department and the hospital prior to use in the study. A formal and validated quality of life survey was not used due to the longer length and duration required. The phone survey included 11 items and is listed in "Appendix". Due to the smaller expected cohort and the use of a subjective Likert scale rather than numerical data, the results of the phone survey are reported separately from the results of our retrospective chart review under "Phone survey results".

Statistics

After retrospective collection of data and completion of the phone survey, data analysis was performed on both

continuous and categorical variables collected using Fisher's exact test, Mann–Whitney *U* test, and the Student's *T* test as appropriate with Minitab v17 (Minitab Inc, State College, PA).

Results

Patient demographics and underlying disease processes

Forty-two ACE patients were identified from 1999 to 2013, with 19 females (45%) and 23 males (55%). The majority of patients were insured by Medicaid (60%). The remainder had private insurance (14%) or coverage was not reported (26%). Average age at the time of procedure was 10.1 years, with a range of 3–20 years. Indications for surgery included functional constipation ($n=12$, 29%), imperforate anus ($n=8$, 19%) Hirschprung's disease ($n=6$, 14%), Spina Bifida ($n=6$, 14%), slow-transit constipation ($n=5$, 12%), neurogenic bowel secondary to cerebral palsy ($n=3$, 7%), neurogenic bowel secondary to transverse myelitis ($n=1$, 2%), and neuronal intestinal dysplasia ($n=1$, 2%).

Mean duration of pre-operative symptoms was 80.3 months, with 22 (53%) patients having symptoms since birth. Constipation alone was noted in 18 patients (43%) and encopresis alone was noted in three patients (7%). Twenty-one patients (50%) had a combination of both constipation and encopresis. All patients tried maximal medical therapy prior to surgery and had refractory symptoms. Urological problems (VUR or neurogenic bladder) were the most common co-morbidity, in 45% of patients.

Intraoperative and inpatient outcomes

Eighteen patients (43%) underwent an open procedure and twenty-four patients (57%) underwent a laparoscopic procedure. The vast majority used the appendix as a conduit when available (95%). Nineteen cases used a catheter, while the remaining 23 cases used a Chait tube. Average post-operative LOS was 3.11 days, with a significant reduction in the LOS with a laparoscopic approach (4.9 days open versus 1.8 days laparoscopic, $P<0.001$). Five patients (12%) required subsequent revision. Indications for revision included inflammatory mass at the catheter site ($n=1$), excess granulation tissue ($n=1$), conduit perforation during tube exchange ($n=2$), and conversion to intermittent catheterization requiring revision ($n=1$).

Short- and long-term outcomes for all patients

Short-term complications that occurred within 2 weeks of surgery were noted in ten patients (24%). Of these ten patients, surgical site infection was the most common complication (50%), which all responded to antibiotic therapy and did not require surgical revision. All short-term complications are reported in Table 1. Long-term complications occurred in 95% of patients, of which almost all were minor in nature. Leakage of stool from the ACE site was the most common complication (64%) followed by a dislodged/broken tube requiring replacement (60%). Recurrence of symptoms (constipation and/or soiling) occurred in 11 (26%) patients and required adjustment in the flushes. ACE site bleeding from granulation tissue was noted in 6 (15%) patients, and all responded to topical chemical coagulation with silver nitrate. Long-term complications are also reported in Table 1.

Mean duration of ACE usage was 51.2 months, with 64.3% still having the ACE at most recent follow-up appointment. Thirty-two patients (76%) required at least one tube exchange, with a majority requiring replacement in the operating room (OR). Each patient required an average of three OR catheter tube exchanges. Eight patients (19%) were converted to intermittent catheterization instead of the Chait tube. Fifteen patients (36%) had their ACE removed. Of these patients, eight patients no longer needed the ACE, while seven patients no longer found the ACE helpful and were, therefore, classified as long-term failures.

Post-operatively, 33 patients (79%) reported improvement in bowel symptoms. The number of children experiencing encopresis more than three times per month decreased from 79 to 5% ($P<0.001$). Hospital admissions for bowel cleanout or fecal disimpactions decreased from 52 to 19% ($P<0.01$). The average number of bowel movements per

Table 1 Short- and long-term complications

Complication	Description	*N* (%)
Short-term complications (≤2 weeks after ACE)	Surgical site infection	5 (11.9%)
	Post-operative fever	2 (4.7%)
	Delayed return of bowel function	2 (4.7%)
	UTI	2 (4.7%)
	Dislodged catheter	1 (2.4%)
	Total short-term complications	10 (24%)
Long-term complications (>2 weeks after ACE)	Leakage from ACE site	27 (64.2%)
	Dislodged/broken tube	25 (59.5%)
	Persistent constipation or soiling	11 (26.2%)
	Nausea, vomiting, or abdominal pain with flushes	10 (23.8%)
	Tenderness at ACE site	9 (21.4%)
	Surgical site infection	7 (16.7%)
	Scar or granulation tissue	6 (14.2%)
	Clogged catheter	5 (11.9%)
	Stenosis or difficult cannulation	4 (9.5%)
	Total long-term complications	40 (95.2%)

week decreased from 10.5 to 6.0 ($P=0.02$), which is a surrogate for improved bowel control from proper clean out, as encopresis was recorded as having had a bowel movement pre operatively by most families.

Outcomes stratified by diagnosis

Outcomes were also stratified according to pre-operative diagnosis. The strata were defined as functional constipation, which included Hirschsprung's disease and spina bifida, and slow-transit constipation, which included imperforate anus and neurogenic bowel. Changes in frequency of soiling, average bowel movements per week, and admissions for impaction were evaluated. All cases of Hirschsprung's disease, functional constipation, and spina bifida were successful, with significant decreases in rates of soiling and admission for bowel cleanouts. Success rates varied for other diseases such as slow-transit constipation (60%), imperforate anus (50%), and cerebral palsy (33%). These results are reported in Table 2.

Outcomes stratified by flush

Data were also analyzed according to volume, type, and frequency of flushes. Changes in encopresis, average bowel movements per week, and admissions for impaction were evaluated. High-volume flushes (> 250 cc) were noted to be more effective than low-volume flushes (≤ 250 cc) and led to significant decreases in soiling, average bowel movements per week, and admissions for impaction. Both once-daily and twice-daily flushes showed significant reductions in rates of soiling, but only daily flushes showed a significant decrease in admission for bowel cleanouts. These results are reported in Table 2.

A total of 35 patients (83%) required changes in their flush regimen. Twelve patients (29%) required change in flush solution with addition of irritants such as glycerin or castile soap, 14 (33%) required an adjusted volume or frequency, and nine (21%) required both. Of all successful patients, 28 (85%) required a change in flush regimen to result in improved symptoms. As mentioned in the study methodology, a successful outcome was defined as remaining clean with ≤ 1 accident per week or adequate reduction of symptoms to stop using the ACE entirely.

Phone survey results

The overall response rate for the phone survey was 62%, with 15 (58%) males and 11 (42%) females. Based on a 10-point Likert scale (1—not at all, 10—completely), average rating of satisfaction was 8.3, ease of use was 9.4, and discomfort with use was 3.6. Overall, 19 (73%) patients had long-term satisfaction with the ACE. Fourteen patients (74%) were still using the ACE and five patients (26%) no longer required

Table 2 Outcomes stratified by underlying disease process, flush volume, and flush frequency

Strata	Subcategory	*N*	Clinical outcome	Pre-ACE, *N* (%)	Post-ACE, *N* (%)	*P* value
Underlying disease process	Hirschsprung's disease functional constipation spina bifida	24	Soiling	19 (79.1%)	2 (8.3%)	$P<0.001$*
			Average BMs/week	9.7	6.1	$P=0.20$*
			Admission for impaction	12 (50%)	3 (12.5%)	$P=0.01$*
	Slow-transit constipation imperforate anus neurogenic bowel	18	Soiling	13 (72.2%)	3 (16.7%)	$P<0.01$*
			Average BMs/week	11.66	5.56	$P=0.02$*
			Admission for impaction	8 (44.4%)	5 (27.78%)	P=0.49*
Flush volume	Low-volume flush (≤ 250 cc)	18	Soiling	11 (61.1%)	1 (5.6%)	$P=0.001$*
			Average BMs/week	6.53	6.51	P=0.93*
			Admission for impaction	6 (33.3%)	3 (16.7%)	$P=0.44$*
	High-volume flush (> 250 cc)	21	Soiling	20 (95.2%)	4 (19.1%)	$P<0.001$*
			Average BMs/week	12.17	5.86	$P=0.03$*
			Admission for impaction	12 (57.1%)	4 (19.1%)	P=0.03*
Flush frequency	Daily flush (QD)	21	Soiling	19 (90.5%)	2 (9.5%)	$P<0.001$*
			Average BMs/week	8.82	6.75	$P=0.33$*
			Admission for impaction	10 (47.6%)	3 (14.3%)	$P=0.04$*
	Twice-daily flush (BID)	14	Soiling	12 (85.7%)	3 (21.4%)	$P<0.01$*
			Average BMs/week	14.79	5.29	$P=0.03$*
			Admission for impaction	10 (71.4%)	5 (35.7%)	$P=0.13$*

BM bowel movements, *QD* daily, *BID* twice daily

*Student *T* test

§Fisher's exact test

its use. There were 17 reported long-term complications. Dislodged tubing was the most common complication, seen in eight patients (31% of respondents). All activity-based outcomes and long-term complications from the phone survey are reported in Table 3.

Discussion

There was a significant improvement in encopresis and constipation with the use of the ACE in our patients. While there were a variety of long-term complications in almost all cases (95%), most were relatively minor and easily managed when compared to the patient and family perceived benefit provided by the ACE. With a decrease in the rates of soiling, improvement in number of bowel movements per week, and reduced hospital admissions, the ACE significantly improved a child's quality of life and social functioning. This validates the previous quality of life surveys which also found significant improvements in fecal continence, social habits, independence, and physical activity in pediatric patients after appendicostomy or cecostomy for medically refractory encopresis [13].

The introduction of Rome IV criteria in 2016 has helped formalize the definitions of functional gastrointestinal disorders through the Delphi method of consensus [14]. These criteria include definitions for functional constipation in the neonate and toddler (< 4 years of age) and in the child and adolescent (≥ 4 years) [15, 16]. These consensus guidelines will assist clinicians, pediatricians, and surgeons in identifying pediatric patients with functional constipation who may eventually require surgical intervention. Medical treatment of both encopresis and constipation typically begins with conservative measures, including dietary changes, stool softeners, enemas, and laxatives [9]. For functional constipation in particular, softening stools to allow for painless defecation reduces anxiety regarding evacuation and reduces incidence of stool retention [15]. For older children, behavioral interventions can also be effective by encouraging regular toileting and developing a reward system for successful defecation [17]. For persistent symptoms, manual disimpaction and retrograde enemas provide the second-line non-surgical treatment options [9]. One single-center study found significant reductions in fecal incontinence in 83% of pediatric patients using transanal colonic irrigation, recommending this as a second-line therapy prior to considering surgery [18]. Once these options have been exhausted, our study shows that surgical intervention with the ACE procedure can lead to a significant improvement in patients' symptoms and outcomes with use of ACE.

We noted that the success rate in our series was correlated with the diagnosis. All cases of Hirschsprung disease, functional constipation, and spina bifida resulted in successful resolution of symptoms. A higher failure rate was noticed in slow-transit constipation, imperforate anus, and neurogenic bowel patients. This may be due to limited compliance with instructions as well as a lack of follow-up. Higher success rates in specific patient populations may indicate the need to be more targeted in which patients receive an ACE. The previous studies have shown mixed results regarding this theory. While developing flush regimens for ACE patients, Bani-Hani et al. noted that patients with increased rectal tone (for patients with spinal cord injury, cerebral palsy, and history of trauma) may benefit from the addition of a stimulant laxative, suppository, or digital rectal stimulation in conjunction with flushes [19]. The previous studies on post-ACE outcomes stratified by comorbidities found statistically significant improvements in fecal incontinence across

Table 3 Phone survey results

Phone survey category	Outcome	Total $N = 26$ (%)
Activity-based outcomes	Problems with running	4/21 (19%), five excluded because wheelchair-bound
	Problems with swimming	2/21 (9.5%), five excluded because wheelchair-bound
	Problems with chores	1 (3.8%)
	Problems at school	2 (7.7%)
	Problems with bathing	0 (0%)
Long-term complications	Dislodged or eroded tubing	8 (30.8%)
	Bleeding or skin irritation	3 (23.1%)
	Leakage	4 (15.4%)
	Surgical site infection	1 (3.9%)
	Inflammatory mass development at site	1 (3.9%)

all etiologies, including patients with history of anorectal malformations, spina bifida, Hirschsprung disease, and functional constipation [8]. Other studies found patients with a history of myelodysplasia have been found to have a higher failure rates post-ACE, possibly secondary to reduced colonic motility from spinal lesions [20]. Despite these lower success rates in pediatric patients with spina lesions, surveys have found 88% satisfaction rates associated with Chait tube placement in management of constipation, attributed to improved hygiene and independence post-ACE [21].

We were also able to identify an important factor that improves the quality of care for our patients and standardize a flush regimen. It is important to continue to modify both the type of solution, and more importantly, the volume of solution when trying to achieve improved results for children. The previous studies have advocated for a step-wise approach in developing a flush regimen for ACE patients, beginning with a tap water regimen with gradually increased volumes and increase toilet times as needed to ensure appropriate cleanout. For refractory incontinence/constipation, clinicians would add polyethylene glycol, then mineral oil or glycerin to the regimen to achieve maximal continence rates among patients [19]. Our data suggest that starting children on a higher flush volume (> 250 mL or ~ 20 mL/kg) may prove to be more successful than a lower volume. If children cannot tolerate the higher volume initially, they should be started on lower volumes with a goal of gradually increasing the volume to achieve maximum results.

Regarding the frequency of ACE flushes, in our study, once-daily (QD) versus twice-daily (BID) flushes showed no significant difference in terms of resolution of symptoms. A previous study of 11 pediatric patients who underwent ACE procedure found that patients with dilated transverse and descending colons initially required large volume enemas and longer evacuation times. With daily irrigation, the diameter of the colon decreased and motility improved, allowing for eventual titration to lower volume enemas and reduced frequency [9]. Therefore, according to our data, QD flushes can be recommended over BID flushes as this regimen would likely improve patient satisfaction and compliance. Our results support adjusting a patient's flush regimen starting with the solution type and volume, rather than the frequency, if a patient presents with refractory symptoms.

Minor complications were very common in our series, and we now warn families to expect these such as granulation tissue and tube dislodgement. In the literature, the most commonly reported complication after ACE was stomal stenosis, reported in up to 30% of patients, which was not as common in our cohort [22]. Other reported complications include pain with irrigation, stomal prolapse, leakage of stool/gas from stoma, surgical site infection, intraabdominal abscesses, conduit ischemia, granulation tissue, conduit perforation, small bowel obstruction secondary to adhesions, and cecal volvulus [8–10, 12, 21, 23]. The previous studies have also found significantly higher rates of post-operative complications in younger ACE patients (7 years or younger) when compared to older ACE patients. This could be related to a tendency towards non-compliance or lack of body awareness among these younger patients [4, 24]. The relationship of resolution of symptoms and age remains unclear. One retrospective review found that patients under 12 years had a higher likelihood of complete resolution of symptoms, while another study found no association between age and rates of post-ACE incontinence [12, 19].

In our study, five ACE patients (12%) required reintervention for various indications. Another single-center retrospective review of 236 patients found a 16% reintervention rate that was independent of the surgical method used for the initial ACE procedure [10]. Possible interventions to reduce the risk of these complications include the use of ACE stoppers within the stoma to maintain patency and performing concomitant cecopexy to the abdominal wall to reduce risk of cecal volvulus [8, 23, 25]. Given the possibility of potentially life-threatening complications post-procedure, routine follow-up with the patient's primary care provider is crucial for ACE patients.

We acknowledge several limitations and weaknesses within this study. The retrospective analysis leads to issues with selection and recall bias as well as missing data due to incomplete charting. Specifically, three patients had undocumented flush volumes and seven patients had undocumented flush frequency. Sixteen patients were lost to follow-up, which affects the outcomes of this study. This study only reflects a single institution's experience with ACE success, which inherently leads to bias regarding institutional operative, tube, and flush regimens. There were also limitations on the level of clinical detail obtained by the phone surveys to reduce potential time commitment for caregivers and increase participation. Despite these limitations, our study does report relevant data and findings for the pediatric surgery community. Our study sample was moderate in size compared to previously published clinical studies (range 12–93), thereby adding to the scientific body of knowledge regarding long-term outcomes after ACE procedures [11, 26]. Furthermore, this provides important data regarding long-term results through both chart review as well as our follow-up phone survey. Future studies should be conducted in a prospective fashion, with a focus on interventions for complications and refractory symptoms. Future studies should also focus on confirming which medical conditions achieve the best results with the ACE.

Conclusion

The ACE is a viable option to improve the lives of children suffering from fecal incontinence and/or chronic constipation. Long-term complications seem to be minor, while

satisfaction and improvement in everyday functioning are significant. According to our single-institution experience, high volume, single flush per day and adding irritants to the solution are important contributors to successful long-term clinical outcomes with ACE. Future studies focusing on patient selection and management of complications and refractory symptoms are needed to better understand this complex patient population.

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Compliance with ethical standards

Financial disclosure The authors have no financial relationships relevant to this study to disclose.

Conflict of interest Michelle Zeidan declares that she has no conflict of interest. Suniah Ayub declares that she has no conflict of interest. Shawn Larson declares that he has no conflict of interest. Saleem Islam declares that he has no conflict of interest.

Ethical approval This study was approved by the Institutional IRB at the University of Florida. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent As a retrospective chart review, for this type of study, formal informed consent is not required. This was approved by the institutional IRB at the University of Florida.

Appendix: Phone survey

Question #1: Are you still using the ACE?

Question #2: How often are you using the ACE? What is the regimen?

Question #3: If not still using the ACE: Was the tube removed? Was it no longer needed? Was it ineffective/not working? Leakage/other complications?

Question #4: Are you still having any of the following: constipation? Soiling/encopresis? If so, how often? Abdominal distention? Other problems?

Question #5: Even if not still using the ACE, what regimen were you/are you using? (including amount, frequency, and type of solution).

Question #6: On a scale of 1 to 10, did the ACE help you overall? (1: No, 5: Neutral, 10: Yes, completely).

Question #7: On a scale of 1 to 10, was/ is the ACE easy to use? (1: extremely difficult to 10: very easy).

Question #8: On a scale of 1 to 10, what was the discomfort level in using the ACE? (1: no discomfort to 10: extremely uncomfortable).

Question #9: Were there problems with any of the following with the ACE (Y/N): running, swimming, bathing, chores, and school.

Question #10: Have you had additional surgery on your intestine or the stoma? If yes, please describe.

Question #11: Any other comments?

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