



Development of a multidisciplinary colorectal and pelvic health program: Program implementation and clinical impact



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ABSTRACT

Introduction: Pediatric patients with complex colorectal and genitourinary conditions often require coordinated multidisciplinary care; however, this coordinated care can be hard to structure and deliver. The purpose of this paper is to review the development and implementation of a multidisciplinary colorectal and pelvic health program, one year after the program's initiation.

Methods: This is an observational retrospective 1-year study (10/1/2017 to 9/30/2018). In fiscal year (FY) 2018, a multidisciplinary colorectal and pelvic health program was initiated.

The program development incorporated bimonthly team meetings, educational conferences, and initiation of three clinics: a complex colorectal and genitourinary reconstruction clinic, a bowel management clinic, and a colonic motility clinic. Conditions treated included complex anorectal and cloacal malformations, Hirschsprung disease, and idiopathic constipation. The fiscal year was selected to provide comparative administrative data after program implementation.

Results: During the study period, 121 patients underwent comprehensive collaborative evaluation of which 58 (47%) were new to the institution compared to 12 (19%) new patients in the previous year ($p < 0.001$). In FY 2018, there were 130 procedures performed and 512 collaborative visits with an average of 47 visits per month. This was a 3.4-fold increase in visits compared to FY2017 (171 visits). Of the new patients, 60% (35/58), traveled a median of 181 miles, representing 33 statewide counties, and 4 states compared to a median of 93 miles in the previous fiscal year ($p = 0.004$).

Conclusion: The development of a colorectal and pelvic health program is feasible and requires a collaborative approach, necessitating multiple service lines within an institution. Program creation and implementation can result in rapid institutional clinical growth by filling a local and regional need through coordinated multidisciplinary care.

Level of evidence: IV

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Anorectal malformations (ARMs) represent a diversity of congenital defects which may be associated with significant morbidity, resulting in long-term sequela of genitourinary and bowel dysfunction in approximately one third of patients despite adequate initial surgical treatment [1,2]. Additionally, up to 70% of these diagnoses have been reported to

be associated with other congenital anomalies [3,4]. These additional congenital anomalies may result from chromosomal abnormalities and can involve the heart, spine, and genitourinary systems. Management of complex anorectal and/or pelvic malformations can be challenging and often requires care from multiple pediatric specialists particularly as care extends beyond the surgical reconstruction throughout the patient's childhood.

In an effort to address the needs of medically complex patients, the creation of multidisciplinary programs has been described in the

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literature, though each program has unique components [5–7]. This strategy has been incorporated for various complex conditions in both the adult and pediatric population and has been shown to improve patient outcomes, reduce patient anxiety and result in overall improvement of quality of life over time [8–11]. In regards to congenital pediatric colorectal and pelvic disease, the introduction of a multidisciplinary center model has recently been described by Levitt et al. where the authors described the model of a multidisciplinary care team (MCT) approach for collaborative medical and surgical decisions across specialties [12].

As care for the medically complex patient has continued to evolve, we sought to restructure the colorectal program at Texas Children's Hospital to improve access and coordinated care for patients with complex colorectal and genitourinary diseases. Using the MCT model and in close collaboration with the Center for Complex Colorectal and Pelvic Reconstruction (CCPR) at Nationwide Children's Hospital, the program launched in the fall of 2017. The premise of the structured program was that there was an unmet need within the local and regional catchment area of the medical center and that providing such a program would significantly increase access and quality of care for patients with colorectal and genitourinary anomalies. The purpose of this study is to describe the structure and composition of a new colorectal and pelvic health (CPH) program, and how such a multidisciplinary program impacts the pediatric colorectal and pelvic health needs within a local and regional framework.

1. Methods

1.1. Patient population and data collection

A review approved by the Baylor College of Medicine institutional review board (IRB, H-44245) was performed of pediatric patients evaluated at Texas Children's Hospital between October 1, 2016, through September 30, 2018, for colorectal and pelvic malformations. The records were reviewed in 12-month intervals from October to September since this is the fiscal year for the institution and facilitated review of administrative data of interest. Conditions treated were imperforate anus, cloacal malformations, Hirschsprung disease, colon motility disorders (idiopathic constipation and fecal incontinence), and complex urologic anomalies including urogenital sinus and bladder exstrophy. In order to assess the program's utilization, the numbers of patients, clinical visits, and procedures were tabulated. Patient demographics were collected from medical records and included age, sex, medical condition and location.

1.2. Multidisciplinary care team

The multidisciplinary team encompasses four specialties with at least two physicians from each specialty, advanced practice providers (APPs) who are nurse practitioners or physician assistants, a social worker, and a registered nurse who serves as the program coordinator. The four specialties include: general pediatric surgery, pediatric urology, pediatric and adolescent gynecology, and pediatric gastroenterology. Important complementary providers included dedicated pelvic floor physical therapists and psychologists who work closely with our team. The program director is within the division of pediatric surgery as pediatric general surgery encompasses all of the specialty clinics that are part of the program.

2. Clinic management

Each month there is an intake conference to discuss the patients for the upcoming multidisciplinary clinic visits and to discuss programmatic development. Individual patients are reviewed and discussed thereby allowing each specialty to weigh in on necessary preclinic testing and development of a coordinated management plan. From these

multidisciplinary meetings, patient educational material has been created for the bowel management program (Fig. 1) and a cloaca patient passport/scorecard has been developed to standardize cloaca patient care at the institutional level [13]. Within the program, there are three complementary clinic models. The first is a twice monthly multidisciplinary clinic for complex colorectal and pelvic reconstruction, staffed by pediatric surgery, pediatric urology, and pediatric and adolescent gynecology. The clinic day is structured where any patient imaging or lab testing is obtained the morning of the clinic and then the patients are seen the same day. In this clinic patients are seen who need consultation with at least two of the three services during the visit. Diagnoses typically include anorectal malformations, including cloacal malformations and cloacal exstrophy, imperforate anus, and urogenital sinus. The second multidisciplinary clinic is the colonic motility clinic that is staffed by pediatric surgery and pediatric gastroenterology. This is a once monthly clinic that focuses on chronic bowel dysfunction and/or fecal incontinence in patients with Hirschsprung disease post pull-through, anorectal malformations post surgical reconstruction, colonic dysmotility, as well as intractable functional constipation. Finally, there is a weekly bowel management clinic that is staffed by two APPs. An initial bowel management patient is always seen by a pediatric surgeon and one of the APPs. After the initial visit, the APPs take the lead role in the weekly management of the bowel regimen. An attending pediatric surgeon continues to be engaged, however, when surgical decisions are needed.

2.1. Continued education and networking

From a programmatic standpoint, there is an active and ongoing collaboration with two additional complex colorectal and urogenital reconstruction centers (Nationwide Children's Hospital and Seattle Children's Hospital). This collaboration includes a monthly teleconference with presentation and discussion of complex cases from each of the three sites. Furthermore, the pediatric surgeons and Advanced Practice Providers have also visited the collaborating centers for additional training. This training consists of bowel management education for our APPs, while the pediatric surgeons have had the opportunity to observe and participate in colorectal cases. The surgeons who participated received continuing medical education credit for this advanced training. In addition, two pediatric gastroenterologists also visited for several days to attend an established bowel management conference and/or visit the established MCT.

2.2. Cost analysis

An analysis of the financial impact of the CPH program was performed by identifying and gathering data through the institutional administrative office. Hospital and physician practice financial statements were reviewed as separate entities. Individual patient financial data or patient billing was not analyzed. Physician revenue refers to all professional fees received for services rendered by general pediatric surgeons, urologists, pediatric and adolescent gynecologists, and gastroenterologists for operative visits, comprehensive clinic visits, and direct in-patient hospital care for any procedure or clinic visit related to a patient evaluated in the Colorectal Pelvic Health Program. Facility charges refer to fees to maintain the facility. Operating Room (OR) units were tallied and defined as any specific CPT codes billed per surgical case for all CPH patients over the course of the fiscal year. Of note, outside of the hiring of a program nurse coordinator, there were no capital costs which were expended for program initiation. An analysis was performed to see from a provider/hospital standpoint whether such a multidisciplinary approach would be more cost-effective in providing care to patients. This was performed by comparing actual professional fees from the reported fiscal year *versus* a model which compared projected clinical professional charges at the 50th percentile clinical benchmark

Educational Handouts for Bowel Management

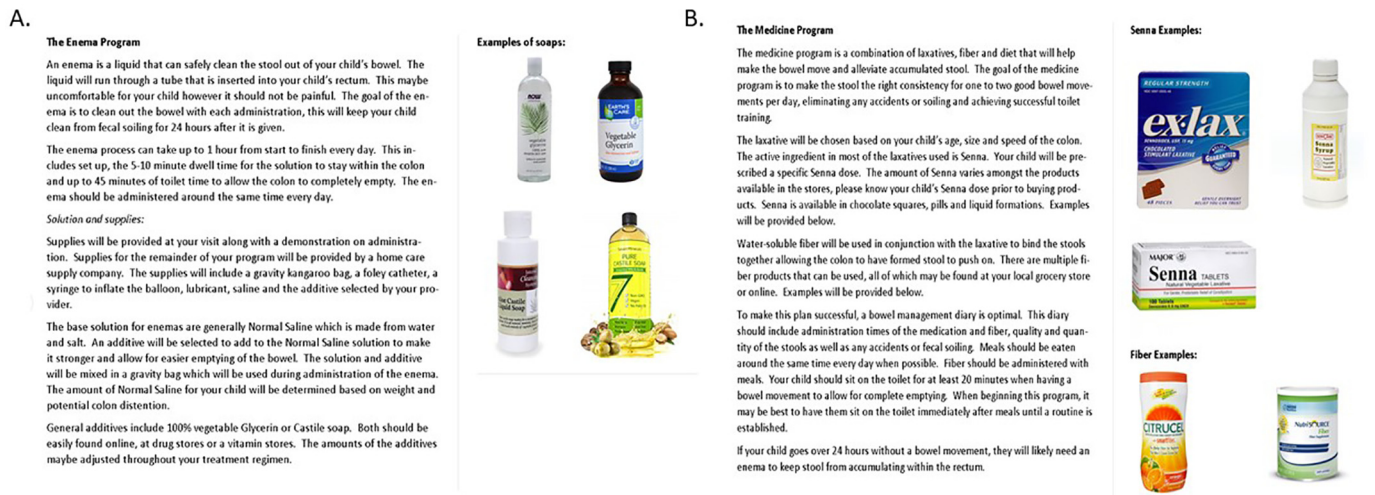


Fig. 1. (A) Educational handout with descriptive and easy to follow instructions on enema use. (B) Educational handout explaining the goal of bowel management and the treatment plan including medication descriptions. Each handout was implemented in FY18 and is now used during clinic visits to supplement educational teaching.

for the providers in the program based on national data obtained from Sullivan-Cotter.

2.3. Statistical analysis

Descriptive statistics were used to analyze general demographics data. Chi-square and Fisher's exact tests were applied for group comparisons. P-values of <0.05 and a 95% confidence interval were considered statistically significant. Data points are listed as mean \pm standard deviation unless otherwise stated. The Statistical Package for Social Sciences (IBM SPSS version 25.0, Armonk, NY IBM Corp) was utilized for all data analysis.

3. Results

3.1. Program expansion

Prior to 2017, the colorectal program was mainly supervised by two pediatric surgery providers. The complex care clinic was scheduled once a month with the participation of gynecology and urology. During this time, there was no formal bowel management clinic, and the colon motility clinic was intermittently staffed. In 2017, a decision was made to restructure and expand the program. The expansion, which included a number of additional medical providers, did not include hiring of any additional providers but was a reassignment and allocation of current providers within each respective division (general surgery, urology, gynecology, and gastroenterology). This served as an attempt to eliminate repetitive clinic visits and allow ease of coordinated operations/procedures for patients across specialties. Currently, there are 5 providers (3 surgeons and 2 advance practice providers) from general pediatric surgery, 4 providers from urology (3 pediatric urologists and 1 physician assistant), 3 pediatric and adolescent gynecologists, and 3 pediatric gastroenterologists for a total of 15 providers. Of note, no provider involved has 100% effort dedicated to the program. Benchmark data were utilized to assess the cost effectiveness of forming such a multidisciplinary program with providers across multiple specialties.

3.2. Patient population

Over the course of the year post program expansion (fiscal year 2018), 121 patients underwent comprehensive collaborative evaluation within the CPH program. Imperforate anus accounted for the majority of clinical diagnoses ($n = 55$, 45%), followed by some form of a colonic motility disorder ($n = 22$, 18%) and/or a cloacal anomaly ($n = 20$, 16%, see Table 1). Of these patients, 58 (47%) were new to the CPH program compared to only 12 (19%, $n = 63$) new patients in the previous year. Of note, this increase was in the absence of an active marketing campaign by the program or hospital. Furthermore, of the new patients to the program, 65% ($n = 38/58$) of patients were completely new referrals from outside of our institutional network system, a 216% increase. The patient population spanned 33 different counties throughout the state and covered patients from 4 neighboring states (Louisiana, Oklahoma, Arkansas, Mississippi) with a median travel time of 2 h and 49 min (81–233 min). Of those that were new to the CPH program, 60% (35/58) traveled a median of 181 (84.6–268.5) miles from outside of their primary city/county to receive care, in comparison to the previous year where the median time to travel for those outside of the network was 1 h 32 min (65–188) or a median of 93 miles (66–188.5) ($p = 0.004$). This encompassed 60% (23/38) of the new referrals from outside of the institutional network. The overall age range of new patients seen spanned from 15 months to 23 years old (Demographics, Table 2.).

3.3. Increase in CPH clinic visits

At the time of program initiation, there was only one primary CPH clinic which was the monthly complex colorectal/urogenital

Table 1
Distribution of clinical diagnosis.

Imperforate anus	45% ($n = 55$)
Colonic motility disorder	18% ($n = 22$)
Cloacal anomaly	16% ($n = 20$)
Hirschsprung's disease	8% ($n = 10$)
Caudal regression	1% ($n = 1$)
VACTERL syndrome	3% ($n = 3$)

Table 2
Patient demographics.

Demographics	n = 121
Sex	
Male (%)	48% (58/121)
Female (%)	52% (62/122)
Race/ethnicity	
Caucasian	45% (55/121)
African-American	16% (19/121)
Hispanic	29% (35/121)
Asian	8% (10/121)
Native Indian or Alaskan Native	2% (2/121)
Age	
Patient age range, all patients	11 months - 25 years old
Patient age range, new patients	15 months - 23 years old
Median age [IQR], all patients (years)	6 [3, 9]
Median age [IQR], new Patients (years)	5 [2.75, 7.25]

reconstruction clinic. With the addition of patient referrals and providers, the program was able to expand the number and diversity of clinics. By January 2018, the CPH program had expanded from monthly to biweekly complex colorectal and pelvic reconstruction clinics and initiated two weekly bowel management clinics, one at our main campus and one at a satellite location. Additionally, a third monthly clinic for colonic motility was created combining the expertise of gastroenterology and surgery. This resulted in a 226% increase in the number of clinic visits post program restructure (Fig. 2), with a total 559 clinic visits in FY2018 in comparison to 171 visits from the previous year. Of the 559 visits, 92% (512) were collaborative, combining the services of at least two specialties in one visit. By month, there was a mean of 47 (± 11.7) visits.

3.4. Institutional financial impact

Along with the increase in comprehensive visits, more than 130 procedures relating to the colorectal health program were performed by CPH providers. This accounts for 760 operative units of charges, more than doubling that of the previous year ($n = 378$ OR units of charges for FY2017), a 101% increase. The procedures were provided by CPH providers from the general pediatric surgery service ($n = 76$ procedures), pediatric gynecology service ($n = 8$), urology ($n = 28$), and gastroenterology ($n = 18$). Professional and facility charges for all services over the 12-month period totaled \$3,033,176 (Table 3). The 38 new

Table 3
CPH professional and facility fee by division.

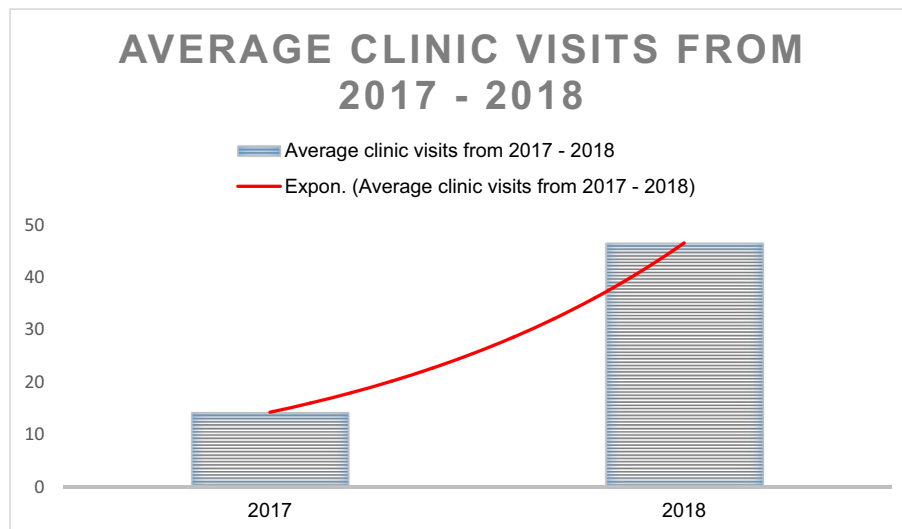
Division	Professional	Facility
Pediatric surgery	\$247,788	\$2,209,891
Urology	\$81,144	\$163,790
Adolescent gynecology	\$28,751	\$19,074
Gastroenterology	\$34,220	\$248,517

patients to the TCH system accounted for \$122,429 in professional fees and \$1,112,988 in facility charges specific to CPH providers. Additionally, when further evaluating the overall increase in institutional downstream revenue (*not just within the CPH program, i.e., radiology, cardiology, etc.*), CPH patients yielded \$273,912 in professional fees and \$1,459,331 in facility charges for all services received once integrated into the system.

An analysis was performed to assess cost-effectiveness of multidisciplinary physician productivity within this multidisciplinary program. The analysis was performed by modeling professional charges at the 50th percentile clinical benchmark (benchmark obtained using national data through Sullivan-Cotter) for the four main specialties supporting the program *versus* the actual professional charges which were generated. If all physicians were working independently at the 50th percentile clinical benchmark, their projected total professional fee charges would be \$461,813 *versus* the actual charges of \$391,903. The overall physician charges of the participating providers within the multidisciplinary program were 15% lower compared to a model where they were would be working independently.

4. Discussion

In this study, we have conducted an observational retrospective review of the development and implementation of a multidisciplinary pediatric colorectal health program. In the inaugural year, the enactment of our program led to an exponential expansion resulting in rapid growth of clinic visits, multidisciplinary procedures, and an increase in institutional revenue. This easily covered, and in fact exceeded the cost of the expanded personnel needed for the program. It is our hope that the program description and data provided will help support the approach and feasibility for similar programs to be created in other locations in order to help facilitate multidisciplinary care of children with significant colorectal and pelvic health care needs.

**Fig. 2.** Colorectal and pelvic health average monthly clinic visits FY17–FY18.

The benefits of creating a multidisciplinary care team are well known and present a practical solution to patients who have complex colorectal and genitourinary conditions. Studies have shown that MCTs result in faster time to treatment, higher adherence to treatment guidelines and cost-effectiveness [14]. The first known description applying this model to the complex colorectal and urogynecologic patient in the literature was by our colleagues at Nationwide Children's Hospital [12]. In their publications, they detail the establishment of a multidisciplinary center for anorectal and pelvic malformations outlining their collaborative algorithm of inpatient, outpatient, and transitional care. To do this, new disorder specific clinics and intake procedures were established. Additionally, collaborative meetings and intraoperative cases increased in frequency during their initial phase. In a short three year period, they showed program feasibility and noted a decrease in inpatient hospitalization, clinic visits, adverse anesthetic events, and improvement with transition of care into adulthood [12,15,16].

It is important to note that the Nationwide model was established as a colorectal center with dedicated employees, resources, and physical space. With their guidance and using their template as a blueprint, we were able to restructure our program; however, as we did not have specified resources dedicated to this endeavor, institution specific strategies were required including reallocation of existing personnel. With this we found that physicians and APPs across specialties previously involved in the care of this patient population were eager to align and streamline the process for patient care. Importantly, this resulted in no new capital costs except for the hiring of a nursing program coordinator. When looking at new patients, 46% of patients were new to our institution. With two additional pediatric surgery groups within our local geographic location and 5 additional pediatric groups throughout the state, it would seem that these types of patients enter our system due to the unique characteristics of a multidisciplinary program, which to our knowledge is only offered by one other institution within the state.

When evaluating the financial impact to our institution, we noted an increase in the downstream revenue from the program, particularly due to a rise in operative procedures. Similar to our study, Mudd et al. evaluated the impact of initiation of a multidisciplinary pediatric aerodigestive clinic. In that study, they found that although clinic visits were condensed, the new multidisciplinary clinic effectively increased their downstream revenue when surgical interventions were taken into consideration [17]. The same group had similar findings when evaluating an MCT clinic for pediatric vascular anomalies, again, particularly with the inclusion of revenue generated with OR utilization [18]. The key discussion point in these studies and from our own study is that the financial analysis of these programs must include a downstream revenue component. Within our own cost-analysis and modeling, it was clear that being in multidisciplinary program did not increase professional charges when compared to modeling of professional charges at the 50th percentile benchmark for providers in our program. We need to recognize that physicians who are in these types of multidisciplinary programs should be given credit for downstream revenue since their professional charges may not fully reflect the impact and benefit they bring to the institution. Therefore, when instituting these programs, the discussion should be focused on the totality of the impact of the program to the hospital system and not just a single metric for the providers.

Throughout the development process, there were a number of lessons which we learned. First and foremost, as previously alluded to, the creation of these types of programs may not require a large capital investment in physical space and personnel. With that being said, one of the most crucial personnel needed for such a program is a dedicated nurse coordinator. The complexity of these patients necessitates a person with a medical background to guide patients through the clinical pathways. Our nursing coordinator is responsible for coordinating clinic visits, serves as a liaison between the multidisciplinary teams, and also provides patient and family education. Additionally, they assist in maintaining patient quality and safety, with quality defined as care that is

safe, effective, patient-centered, efficient and equitable [19]. This includes ensuring appropriate patient use of medications and home-based treatment techniques, revising and improving strategies to avoid patient safety errors, refining care plans so that the plans incorporate all disciplines, and creation of educational handouts such as the one in Fig. 1. In regards to APPs and physicians, this study demonstrated that this can be accomplished with reallocation of existing resources who may already be present in an institution. However, there has to be commitment and shared vision from the medical providers that pursuing such a program is to the ultimate benefit of the patients.

The second lesson learned is that there may be a hidden need in the community for such services. Without any dedicated advertising efforts, we noted a significant increase in patient volume, with a number of families which were willing to travel from outside of the region to receive care from the program. Clinic visits more than quadrupled, resulting in a concomitant increase in collaborative procedures. These results demonstrate the feasibility of creating a structured multispecialty program for pediatric colorectal and urogenital disease. While it is difficult to surmise the precise means of growth, we speculate that this influx was precipitated by our collaborative efforts with an existing colorectal center, direct patient referrals, and parent directed social media. There are several private colorectal health support communities across various popular social media platforms, particularly Facebook, that focus on complex pediatric colorectal/pelvic disorders and many of these families have actively directed patients to our center.

Finally, one of the most important aspects of program success is the fundamental necessity in collaborating with established specialty centers to aid in training and acquisition of the necessary clinical skillset to deliver the highest level of care. Hands on training is ideal for skill and expertise acquisition, but if that is not possible, collaborative conferences through the use of video conferencing can serve as a useful adjunct in discussing difficult cases and staying abreast of changes within the field.

As presented in this study, this model of organizing a multidisciplinary colorectal and pelvic health program should be applicable to children hospitals which have the appropriate service lines and resources to treat patients with complex colorectal and urogenital diagnoses. As the capital investments for this specific program were quite low, the presented model should be appealing to other institutions, broadening the applicability of such a program outside of our own local/regional framework. In regards to the limitations of this study, the study is a retrospective analysis which brings in the inherent limitations such as recall and selection bias and the inability to identify confounders leading to possible over- or underestimation of the described associations. An additional limitation of this study is that the study does not have the comprehensive patient or financial data to fully discuss the concept of healthcare value within the framework of multidisciplinary care. Healthcare value focuses on the delivery of high-quality healthcare at the lowest cost to the healthcare system. This is an extremely important topic in the current healthcare environment and healthcare value has multiple components such as cost of control within delivery of care, hospital/physician reimbursement, patient health outcomes, and patient satisfaction. This is outside of the purview of this specific study paper but future analysis of such multidisciplinary pediatric surgical programs should attempt to answer the question of value based care.

5. Conclusion

Multidisciplinary programs are to the benefit of patients, allowing them to receive specialized coordinated medical and surgical care. Furthermore, the creation of such a multidisciplinary colorectal and pelvic health program can meet a local and regional need. This study provides a descriptive model on the base components of developing a multidisciplinary complex colorectal/urogenital reconstruction program. These types of programs require personnel who are dedicated to this disease, but may not require a large capital investment by the institution to get

started. Furthermore, the allocation of personnel and resources for such programs can be financially advantageous for institutions as well, thereby creating a “win–win” situation for patients, clinicians, and hospital systems.

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