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Single visit surgery for pediatric ambulatory surgical procedures: a satisfaction and cost analysis☆,☆☆,★,★★,☆☆☆

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ABSTRACT

Background: Single visit surgery (SVS) consists of same-day pre-operative assessment and operation with telephone post-operative follow-up. This reduces family time commitment to 1 hospital trip rather than 2–3. We began SVS for ambulatory patients with clear surgical indications in 2013. We sought to determine family satisfaction, cost savings to families, and institutional financial feasibility of SVS.
Methods: SVS patients were compared to age/case matched conventional surgery (CS) patients. Satisfaction was assessed by post-operative telephone survey. Family costs were calculated as the sum of lost revenue (based on median income) and transportation costs ($0.50/mile).
Results: Satisfaction was high in both groups (98% for SVS vs. 93% for CS; $p = 0.27$). 40% of CS families indicated that they would have preferred SVS, whereas no SVS families indicated preference for the CS option ($p < 0.001$). Distance from the hospital did not correlate with satisfaction. Estimated cost savings for an SVS family was $188. Reimbursement, hospital and physician charges, and day-of-surgery cancellation rates were similar.
Conclusions: SVS provides substantial cost savings to families while maintaining patient satisfaction and equivalent institutional reimbursement. SVS is an effective approach to low-risk ambulatory surgical procedures that is less disruptive to families, facilitates access to pediatric surgical care, and reduces resource utilization.
Type of study: Cost Effectiveness Study.
Level of evidence: Level II.

Millions of ambulatory pediatric surgical procedures are performed every year in the United States. Each outpatient procedure disrupts a family's life in some way as they accommodate their schedule for the benefit of their child's health. Conventional pre-operative, operative, and post-operative visits often result in missed work and have associated travel costs. In an era of increasing emphasis on value and optimal patient service in healthcare, these cases represent an opportunity for improvement.

To address the burden placed on families from numerous hospital visits, we implemented a single visit surgery (SVS) program for ambulatory patients with clear surgical indications in 2013. SVS consists of same-day pre-operative assessment and operation, with telephone post-operative follow-up. This reduces family time commitment to a single hospital visit and potentially represents an improvement in quality of care. We hypothesized that SVS would provide equally high family satisfaction compared to conventional surgery (CS), and would provide a cost savings to SVS families while at the same time maintaining institutional reimbursement.

1. Materials and methods

1.1. IRB approval

This work was deemed exempt by the Nationwide Children's Hospital Institutional Review Board (IRB).

1.2. Study design

This was an observational prospective cohort study. For each patient that went through the SVS process, a case- and age-matched CS patient

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from the same time period was identified. The primary outcome of this study was family satisfaction. Secondary outcomes included family cost savings and institutional reimbursement.

1.3. Single visit surgery

Patients in the current study were seen from September 2013 through June 2016. Two surgeons participated in the SVS program. When a referral was sent to the office with one of the pre-defined inclusion diagnoses, the family was contacted to ask if they would like to participate in the SVS program. Inclusion diagnoses included umbilical hernia, inguinal hernia, excision of soft tissue/skin lesions, orchidopexy, and circumcision, in children without comorbidities. All cases were performed in an ambulatory surgery center owned and operated by Nationwide Children's Hospital and located in a Columbus suburb. There were no age criteria other than those set by the outpatient surgery center (≥ 1 month of age). Patients were scheduled for a single visit that consisted of a pre-operative evaluation in the morning followed by operative intervention within 3 h. Post-operative assessment was completed by nursing staff 10–14 days post-operatively.

For this initial study, four SVS patients were scheduled on each operative day. All four patients were seen during a 1 h clinic session in the morning, and their operations were scheduled during the subsequent 4 h. Additional CS patients were scheduled for the remainder of the surgeon's operative block time.

1.4. Family satisfaction

Families of SVS and CS patients were contacted 2 months post-operatively and asked to complete a telephone survey to assess satisfaction. A Pediatric Quality of Life (PedsQL) Satisfaction survey was used, with additional survey questions designed by the authors (Table 1). If families were unavailable, additional attempts to contact the family for survey were made for an additional 8 weeks. All satisfaction questions were answered using a scale ranging from 1 to 4. If a family answered with a 3 or a 4, they were considered to be 'satisfied' with the service. An answer of 1 or 2 was considered 'dissatisfied'.

1.5. Family cost savings

Total cost to the family was estimated as the sum of lost revenue and transportation costs. Lost revenue was determined by identifying median income by zip code, and then calculating 1 day of revenue lost for families of SVS patients and 2 days of revenue lost for the families of CS patients. Transportation costs were calculated at $0.50/mile for travel to reach the hospital, with 1 round trip for SVS patients and 2 round trips for CS patients.

1.6. Hospital reimbursement

The sum of all pre-operative, operative, and post-operative payments associated with the outpatient surgical procedure was determined for all SVS and CS patients. Hospital charges/reimbursement as well as physician charges/reimbursement were evaluated. Physician charges included both surgeon and anesthesiologist charges. Additionally, the day-of-surgery cancellation rate for each group was determined.

1.7. Statistical analysis

Family satisfaction and day-of-surgery cancellation rates were compared using a Chi-square analysis. Ninety patients per arm (180 total) provides 80% power to detect an absolute difference of 7% in the proportion of satisfied patients. Hospital and physician charges are reported as the median and interquartile range (IQR), and were analyzed using the Mann–Whitney *U* test. p Values of <0.05 were considered statistically significant.

Table 1
Satisfaction survey questions.

	Each Question Is Answered with a Number Ranging from 1 to 4
PedsQL Satisfaction Survey - How satisfied were you with:	
Information	**Communication**
How much information was provided to you about your child's diagnosis.	How well the staff explained your child's health condition and treatment to YOUR CHILD in a way that she/he could understand.
How much information was provided to you about the treatment and course of your child's health condition.	The time taken to explain your child's health condition and treatment to YOU in a way you could understand.
How much information was provided to you about the side effects of your child's treatment.	How well the staff listened to you and your concerns.
How soon information was given to you about your child's test/surgery results.	Preparation provided for YOU about what to expect during tests/procedures.
How often you were updated about your child's health.	Preparation provided for YOUR CHILD about what to expect during tests/procedures.
Inclusion of Family	**Emotional Needs**
The sensitivity shown to you and your family during your child's treatment.	The amount of time given to your child to play, talk about her/his feelings, and any questions she/he may have had.
The willingness to answer questions that you and your family may have had.	The amount of time spent helping your child with going back to school.
The effort to include your family in discussion of your child's care and other information about your child's health condition.	The amount of time spent attending to YOUR CHILD'S emotional needs.
How much time the staff gave you to ask any questions you may have had about your child's health condition and treatment.	The amount of time spent attending to YOUR emotional needs.
Technical Skills	**Overall Satisfaction**
How well the staff responded to your child's needs.	The overall care your child received.
Efforts to keep your child comfortable and as pain-free as possible.	How friendly and helpful the staff was.
How much time the staff took to help you with your child going home.	The way your child was treated at the surgery center.
Additional Survey Questions	
Was the pre-appointment packet of information helpful?	Did anyone explain what to expect during your child's recovery period?
Was the appointment scheduling process easy?	Did anyone give you easy to understand instructions about what to do during your child's recovery period?
Was it easy to find a convenient time to schedule the clinic visit and surgery?	How many days did you need to take off work due to your child's surgery (including clinic visit)?
Did you feel that your child had adequate medical evaluation prior to surgery?	How many days did your child miss from school due to his/her surgery (including clinic visit)?
Were you happy with length of time between the clinic visit and surgery?	
Before you left the surgery center, did the surgeon discuss the outcome of the surgery with you?	
For CS Patients Only:	For SVS Patients Only:
If you were to repeat this process in the future, would you prefer to have the surgery performed the same day as your child's clinic appointment?	If you were to repeat this process in the future, would you prefer to utilize a conventional 2–3 visit process for your child's surgery rather than SVS?
Would such a service make the scheduling process easier and more convenient for you?	Would you recommend this service to a family member or friend?

2. Results

2.1. Patient characteristics

There were no significant differences between SVS and CS patients (Table 2). Ninety patients were identified in each group. Mean age was 5.2 years for SVS patients and 5.1 years for CS patients, with no significant difference in race between the two groups of patients. The most common operation for each group was umbilical hernia repair, followed

closely by inguinal hernia repair. Other cases included soft tissue mass excision, orchidopexy, and circumcision. Patient insurance status was similar between the two cohorts.

2.2. Family satisfaction

Surveys were completed by 52% of SVS families and 30% of CS families. Satisfaction was high in both groups (98% for SVS vs. 93% for CS; $p = 0.27$). Forty percent of CS families indicated that they would have preferred the SVS option, whereas no SVS families indicated preference for the CS option ($p < 0.001$) (Table 3A). In the CS group, distance from hospital did not correlate with whether or not they would have preferred the SVS option (Table 3B). Forty-four percent of the families that live 20 miles or less from the hospital would have chosen SVS if given another chance, while the same percent of patients that live more than 20 miles from the hospital would have chosen SVS if given a second opportunity.

2.3. Family cost savings

The median yearly household income for families of SVS patients was $43,914, while that of CS patients was $53,004 (Table 4). For SVS families who missed one day of work due to hospital visits, lost revenue was $120.31. For CS families who missed two days of work due to hospital visits, lost revenue was $290.44. SVS families lived an average of 31.8 miles from the hospital, while CS families lived an average of 24.6 miles from the hospital. SVS families traveled a total of 63.6 miles (1 round trip) and incurred an average travel cost of $31.80 ($0.50/mile). CS families traveled a total of 98.4 miles (2 round trips) and incurred an average travel cost of $49.20. Thus, total average cost to an SVS family was $152.11 and total average cost to a CS family was $339.64. The difference in cost between the two groups (estimated cost savings for participating in SVS) was $188.

2.4. Hospital reimbursement

Total hospital reimbursement was $809,878 for the SVS group and $776,762 for the CS group (Table 5). Total charges (hospital and physician charges) were similar between the two groups of patients. Reimbursement was obtained for both the pre-operative assessment and the procedure codes submitted on the same day. Furthermore, day-of-surgery cancellation rates were similar for SVS and CS patients (19.5% and 12.2%, respectively, $p = 0.14$). For both SVS and CS patients, day-of-surgery cancellations occurred for illness in the child and for "no-show" of the family. Additionally for SVS patients, cancellation occurred due to incorrect diagnoses by the referring physician (9 patients), need for further testing (3 patients), or ability to do the procedure in clinic rather than the operating room (1 patient).

Table 2
Patient characteristics.

	Single visit surgery patients (n = 90)	Conventional surgery patients (n = 90)	Statistical analysis
Mean age (years)	5.2	5.1	NS
Race			
White	60 (66.7%)	60 (66.7%)	NS
African American	28 (31.1%)	18 (20.0%)	NS
Biracial/Multiracial	2 (2.2%)	10 (11.1%)	NS
Latino/Hispanic	0 (0.0%)	1 (1.1%)	NS
Asian	0 (0.0%)	1 (1.1%)	NS
Cases performed (%)			
Umbilical hernia repair	37 (41%)	37 (41%)	NS
Inguinal hernia repair	36 (40%)	32 (36%)	NS
Excision of soft tissue/skin lesions	14 (16%)	18 (20%)	NS
Orchidopexy	1 (1%)	3 (3%)	NS
Circumcision	2 (2%)	0 (0%)	NS
Insurance status			
Private Insurance	82 (91.1%)	82 (91.1%)	NS
Medicaid	8 (8.9%)	5 (5.6%)	NS
Uninsured	0 (0.0%)	3 (3.3%)	NS

Table 3A
Patients that would choose the opposite method if given another chance.

	Would choose the same method again	Would choose the opposite method
Conventional patients	59.3%	40.7%
Single visit patients	100%	0%

3. Discussion

In an era of value based and patient-driven care, single visit surgery has been gaining traction and growing in relevance. A few reports of single visit ambulatory surgical procedures have been previously described. In 1999, Tagge et al. outlined a "one-stop surgery" program for pediatric ambulatory procedures, indicating that it was feasible and potentially beneficial [1]. Barnett et al. described a similar service in 2012, and reported that their "one-stop shopping" for pediatric hernia repair was financially feasible for the institution (78% of pre-operative visits reimbursed), and was accompanied by high parent satisfaction [2]. The idea of single visit surgery is not limited to the field of pediatric surgery. Groups in the US and abroad have described single hospital visit adult laparoscopic hernia repair [3], adult "one-stop inguinal hernia surgery" [4] and "one-stop cholecystectomy" [5].

However, despite initial interest in the concept of single visit surgery, there has been no direct comparison of family satisfaction between patients undergoing single visit surgery versus conventional surgery. Additionally, no one has directly compared hospital reimbursement rates between the two groups. This study directly compared satisfaction between conventional surgery patients and single visit surgery patients. Satisfaction was high in both groups, with no demonstrable difference in satisfaction between the two groups. Many of the CS families indicated that they would have preferred to have participated in SVS if it had been offered to them.

The SVS schedule was arranged in a way that minimized waiting time for patients and their families. There were no complaints from families regarding the wait time. Distance from the hospital did not correlate with interest in or satisfaction with SVS. "One-stop" surgery has been branded as particularly useful for families that live far from the hospital. However, our study showed that families that live less than 20 miles from the hospital also prefer SVS, allowing their child's surgical needs to be definitively managed with just a single trip to the hospital. The cut-off of 20 miles was chosen for our institution to differentiate families that live "in town" versus "out of town" in order to better assess the value of SVS in our catchment area. However, this 20 mile cut-off

Table 3B
Choice of conventional patients based on distance from the hospital

	If had to choose again, would choose conventional method	If had to choose again, would choose single visit surgery
Conventional patients living ≤20 miles from hospital	10/18 (55.5%)	8/18 (44.4%)
Conventional patients living >20 miles from hospital	5/9 (55.6%)	4/9 (44.4%)

Table 4
Estimated cost to families based on treatment group.

	Single visit surgery patients	Conventional patients
Lost revenue		
Mean yearly household income	$43,914	$53,004
Mean daily income	$120.31	$145.22
Cost to family in terms of revenue lost	$120.31	$290.44
Travel costs		
Mean distance from hospital	31.8 mi	24.6 mi
Cost per day of travel, round trip ($0.50/mi)	$31.80	$24.60
Cost to family in terms of travel	$31.80	$49.20
Total cost to family (lost revenue + travel)	$152.11	$339.64
Cost savings with SVS program *(difference between CS Patients and SVS Patients)*	$187.53	

may limit the generalizability of this study, and may need to be revised for hospitals in other locations.

There are a number of limitations associated with this study. First, this study is a single center prospective study with limited power in each arm, making it difficult to definitively draw conclusions regarding the superiority of SVS compared to CS. Furthermore there may be inherent bias in the study given the fact that families chose to participate in SVS, and that there was higher survey response for SVS families compared to CS families. Families that chose to participate in SVS and families that opted to complete the survey would be expected to have higher satisfaction. However, family satisfaction was high in both SVS and CS arms, so it is unlikely that this led to any significant bias in terms of overall family satisfaction. And finally, lost revenue for families was estimated using income based on zip code. There is significant variability in income within a zip code, and the estimated incomes used in this study may not reflect the families' actual incomes. However, the exact dollar amount saved by each family was not a primary outcome of this study, and this method of cost analysis was able to provide a general estimate of cost savings in terms of lost revenue.

Another concern with SVS was the 19.5% same-day cancellation rate seen in this study. Although not statistically significant compared to conventional cases, this study is underpowered to detect an absolute difference in cancellation rates between the two groups. Additional patients in each study arm will be necessary to determine if there is indeed a difference in cancellation rates. If a significantly higher cancellation rate with SVS is found, this would likely lead to higher institutional costs due to lost OR time. In our study, some of the same-day cancellations were due to incorrect diagnoses by primary care physicians. We are hopeful that as our SVS program develops further, and as the triage process improves, we can reduce the same-day cancellation rate. However, if we find that our same-day cancellation rate continues to be high, we may have to exclude certain diagnoses from SVS that seem to be repeat offenders (e.g., inguinal hernia). Alternatively, we could require an accompanying photograph with the referral in the case of certain diagnoses such as inguinal hernia in order to further improve diagnostic accuracy.

The primary benefits of SVS are improved service to patients and families as well as significant cost savings to the family. At our institution from July 2015 – June 2016 there were 521 patients who underwent either umbilical or inguinal hernia repair in an outpatient setting. If it is assumed that umbilical/inguinal hernia repairs continue to represent ~80% of the cases available for SVS (Table 2), then in that year there were 650 cases that could have been performed using the SVS approach. This represents 650 families who would have experienced improved patient service and a more efficient course of care for their child. It also represents a cumulative cost savings of ~$105,000 for the families of these patients. Given the median annual income of $43,914 seen in our SVS families, a cost savings of $188 represents 20% of one week's income, which is not insignificant to many families. According to the USDA, it is also the weekly cost of groceries for a family of 4 [6]. These benefits to the family come at no additional cost to the institution.

In the era of value-based care, cost savings without decrease in quality is good for both the institution and the patient. In our institution, Partners for Kids is an accountable care organization that is fully at risk for the care of ~330,000 children. In this program, all funds are capitated. In a capitated model, lower cost of care in one area allows the institution to use its fixed resource pool to help children in other areas. With the implementation of SVS, additional physician staff and time used for pre-operative and post-operative visits can be used for other patients. Transitioning to the SVS process for all eligible pediatric outpatient procedures would further optimize resource utilization without compromising care.

4. Conclusions

SVS is an effective approach for low risk ambulatory procedures that provides more efficient service while maintaining quality of care. It is less disruptive to families and provides families with substantial cost savings, while at the same time maintaining patient satisfaction and equivalent institutional reimbursement. Furthermore, SVS facilitates access to pediatric surgical care and reduces resource utilization. Larger studies are indicated to further assess the cost/benefit ratio of SVS.

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Table 5
Hospital reimbursement based on treatment group.

	Single visit surgery patients (n = 90)	Conventional surgery patients (n = 90)	Statistical analysis
Total reimbursement for cohort of patients	$809,878.00	$776,762.02	n/a
Total charges for cohort of patients	$832,011.87	$839,247.78	n/a
Median charges per patient (IQR)	$9136.16 ($8424–10,507)	$9139.35 ($8147–10,827)	$p = 0.981$
Median hospital charges per patient (IQR)	$6471.27 ($6150–7159)	$6539.75 ($5850–7649)	$p = 0.646$
Median physician charges per patient (IQR)	$2665.00 ($2432–2994)	$2650.00 ($2375–3141)	$p = 0.851$
Day-of-surgery cancellation rate	19.5%	12.2%	$p = 0.14$

Appendix A. Discussions

Jacob Olson, Columbus OH

DIANA FARMER (Sacramento, CA) Thank you. That is a very interesting and provocative paper, and I know lots of people are thinking about these things. It was controversial several years ago when folks just presented the telephone follow up for hernias and whether that was going to be a problem. My question is, how did you screen patients to select them for the SVS, kind of know that their umbilical hernia might be appropriate? Do you have specific pediatricians that you work with? How did you do sort of the preplanning for that? Thank you.

JACOB OLSON We had a designated nurse that was involved in screening the patients, so when she received a referral that looked like a qualifying diagnosis, she would contact the family and go through a set of questions with them to see if she thought it was something that would be appropriate for single-visit surgery. Then she also discussed with them that it was going to be a single visit, but there was a chance that they would not have the correct diagnosis and would not get surgery that day. She kind of explained the whole process to them.

EDWARD TAGGE (Loma Linda, CA) So we presented this 19 years ago at APSA, a very similar study, and I would agree with Dr. Farmer that the line went out the back door about the concern that the surgeon was advocating the postoperative follow up of the patient, so we in our series did not see any complications that were missed with the phone follow up system. It obviously helps the patients and their families and also unloads the clinic from all these postoperative patients where you could be seeing new patients that might actually generate more business. That is just a comment. One question is, did you see any complications from this phone follow up where there is some concern that might have been picked up if you saw them back in the clinic?

JACOB OLSON We did not see any complications with the telephone follow up. In addition most of our conventional surgery patients get telephone follow up anyway, so it was not a big change as far as follow up goes at our institution. Primarily it was just a change with the initial preoperative visit.

UNIDENTIFIED SPEAKER So when you scheduled the appointment, did you also put them on the OR schedule in your block time? What percentage of these children did you find that you were not going to operate on, and how many of them actually were NPO violators even if they were indicated for surgery?

JACOB OLSON Yes, we put them on the OR schedule so that they could get the surgery approved and paid for and everything - it was just the usual process set up for the OR schedule, and then as far as how many were canceled on the day of surgery, about 19% of surgeries were canceled the day of surgery. There were 12% that were canceled in the conventional surgery approach, so a little bit higher but not statistically significant of a difference. The primary reason was for incorrect diagnosis such as a hydrocele if the diagnosis was inguinal hernia or something of that nature, and the surgeon who was involved was good at explaining to the patient that they knew we were not going to go ahead with the procedure if it was not indicated, and most families were fine with that because they knew that was a possibility coming into the visit.

DOUG MINIATI (Roseville, CA) Nice presentation. I know there was not statistical significance, but that 19% cancellation rate would certainly catch the eye of my operating room care committee and utilization, so what are you guys doing to improve that?

JACOB OLSON Well, there are two things. Hopefully as we expand the program and continue to gain more experience that our triage will improve, and we will be able to better identify who will be good surgical candidates. If we continue to see that there is a large discrepancy, maybe we would have to exclude certain diagnoses that tend to be the ones that we are always missing to just improve the efficiency of the program.

DOUG MINIATI Great. Thank you.

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