

Fast-track surgery concepts for congenital urogenital anomalies



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AIM: To investigate the possibility of fast-track surgery concepts in pediatric urology department as a single center study model of a developing country.

MATERIAL OF STUDY: The study included 1620 patients surgically treated at the pediatric urology department, from 2009 to 2011. According to the congenital anomalies, all patients were classified in one of four groups: I – testicular anomalies (197 patients); II – external genital anomalies (453); III – upper urinary tract anomalies (801) and IV – associated anomalies (169). We analyzed the total duration of stay in the hospital of all patients among all treating doctors concerning the anomaly.

RESULTS: Statistically significant difference in total length of hospitalization of all patients in Group I was noted in Doctors 1 and 5 ($F=10.36^{**}$ for $F_{0.05;5;12}=3.11$ and $F_{0.01;5;12}=5.06$), as well as in the Group II ($F=17.01^{**}$ for $F_{0.05;5;12}=3.11$ and $F_{0.01;5;12}=5.06$). Statistical analysis was not possible to be performed in groups III and IV because of lack of the patients.

DISCUSSION: Analyzing the length of hospitalization of the patients treated at the urology department, all doctors showed the tendency to shorten the total length of hospitalization in patients of all groups. Majority of the studies carried out on pediatric urology departments in developed countries, showed that over 50% of children were successfully treated using fast-track surgery concept.

CONCLUSIONS: Modern methods of surgical management and anesthesia allow decrease of hospitalization length, financial savings to the healthcare system and better comfort for patients.

KEY WORDS: Children, Fast-track surgery, Hospitalization, Urogenital anomalies.

Introduction

Urogenital congenital anomalies are among the most frequent congenital anomalies and very common patholo-

gy in pediatric surgery. Modern technology allows the use of minimally invasive surgical procedures, including appropriate preoperative preparation, anesthesia, postoperative pain management, as well as rapid mobilization of the patient and initiation of oral intake of fluids and food.

The term *day case* or *out-patient surgery* was introduced back in 1909 by Nicoll, analyzing the treatment results obtained at the Glasgow Children's Hospital and coming to the conclusion that equally good results were achieved in children treated at the same hospital for the same disease hospitalized in the out-patient department and those who were hospitalized for longer, with obviously more efficient use of hospital facilities and reduction in costs¹.

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Fast-track surgery was conceived in the nineties of the past century by a Danish surgeon, Helmut Kehlet, to optimize the convalescence of adult patients who undergo elective surgical procedures. The concept includes pre-operative instruction of the patients and parents, preference of minimally invasive surgical procedures, special emphasis on pain management and avoidance of drains, tubes and catheters as well as immediate postoperative introduction of oral food and fluids and mobilization of the patient ².

One-day surgery brings more comfort for the patient, faster recovery, decrease of nosocomial infections and stress and reduction of parent-child separation, and for health institutions and health care system as a whole, better cost-effectiveness and more efficient utilization of capacities.

Fast-track surgery concepts are feasible for most major surgical procedures in adults, as reported by several studies ³⁻⁶.

In addition, several surgical procedures in children are performed (circumcision, inguinal hernias, hydroceles, cryptorchidism, pyeloplasty, appendectomy, bowel anastomosis, fundoplication, hypospadias surgery, and full/partial nephrectomy) as a one day surgery in the majority of children's hospital throughout the world, but there is a lack of reports in the literature regarding fast-track surgery concepts in pediatric surgery in a developing country setting ⁷⁻⁹.

The aim of this study was to investigate the possibility of performing the fast-track surgery concepts in pediatric urology at University Children's Hospital, as a single center study model of a developing country.

Material and Method

The retrospective-prospective study was conducted at the Department of Urology at University Children's Hospital, and included 1620 children with the mean age of 5.44 ± 4.59 years (range 0.1-18) surgically treated during three successive years (from January 2009 to December 2011) for some of the anomalies of the urogenital system, after local ethical committee approval was obtained.

Fast-track concepts emphasize the importance of pre-surgical interviews with parents and children. Surgeons and anesthesiologists informed the parents on the upcoming procedure, explaining in detail all different aspects of the treatment itself (surgical procedure, type of anesthesia) and post-operative care that the child would need following the fast-track surgical procedure. Oral feeding and mobilization were introduced two hours following surgery. Pain was managed using a caudal block at the end of surgery with a long-acting local anesthetic (bupivacaine 0.25mg/kg of 5mg/mL), when indicated, followed by oral or rectal administration of nonsteroidal anti-inflammatory drugs, with rare use of opioid anal-

gesics. Drains, nasogastric tubes and catheters were not routinely used.

Criteria for patient discharge home included good general condition, passing of urine, body temperature below 38 C, complete oral nutrition, mobilization, exclusion of local infection, adequate pain control with oral analgesics and parent readiness for home care. All congenital urogenital anomalies were classified into four broad groups: I. Anomalies of the testes; II. Anomalies of the external genitals; III. Anomalies of the upper urinary tract and IV. Associated anomalies (present with two or more of previously mentioned anomalies).

Exclusion criteria from the study were hospitalization due to diagnostic procedures, treatment of other disease etiology, conservative treatment, children treated by doctors from other departments and children with unavailable or incomplete medical records.

The study analyzed total duration of hospitalization, as well as duration prior to and following the elective surgical procedure. Analyses were performed across the whole sample, as well as across the subgroups of samples classified by the surgeon and congenital anomaly, using arithmetic mean as a typical indicator of empirical distribution, Analysis of variance (ANOVA) with the significance of $\alpha = 0.01$ and $\alpha = 0.05$.

Results

Total of 3753 patients were hospitalized from January 2009 to December 2011 at Department of Urology at University Children's Hospital. The study included 1620 patients (1271 boys and 349 girls) who completed the inclusion criteria for the study. The total mean duration of hospitalization over the study period was 6 days. The mean duration of hospitalization of the patients treated at the Urology department during 2009 and 2010 was 6 days, while in 2011, it was 4 days.

In view of mean hospital stay during the study period (2009-2011), patients with the anomalies of the testes (group I) had the mean hospital stay of 3 days, patients

TABLE I - Mean length of hospitalization of all patients classified to the treating physician in days during the study period.

Treating physician / number of patients	Mean length of hospitalization of all patients (days)		
	2009	2010	2011
Doctor 1 / 497	6	6	5
Doctor 2 / 185	9	5	4
Doctor 3 / 195	7	7	6
Doctor 4 / 242	7	6	6
Doctor 5 / 422	6	4	3
Doctor 6 / 79	3	7	4

TABLE II - Length of hospitalization of all patients classified according the congenital anomaly and treating physician during three consecutive years (2009-2011) presented in days.

Physician	Year	Preoperative hospitalization (days)				Postoperative hospitalization (days)				Total hospitalization (days)			
		Group I	Group II	Group III	Group IV	Group I	Group II	Group III	Group IV	Group I	Group II	Group III	Group IV
Doctor 1	2009	2	2	2	2	2	5	4	6	4	7	6	8
	2010	2	1	1	3	1	6	3	8	3	7	4	11
	2011	1	2	2	3	2	4	2	5	3	6	4	8
Doctor 2	2009	4	2	4	3	2	10	5	4	6	12	9	7
	2010	1	3	2	3	2	3	3	3	3	6	5	6
	2011	1	1	1	2	1	3	3	4	2	4	4	6
Doctor 3	2009	1	3	4	4	2	3	3	6	3	6	7	10
	2010	2	2	2	†	2	9	5	†	4	11	7	†
	2011	1	2	2	1	1	8	5	2	2	10	7	3
Doctor 4	2009	3	3	3	3	1	6	4	6	4	9	7	9
	2010	1	2	3	2	2	6	4	5	3	8	7	7
	2011	1	2	2	1	1	6	3	6	2	8	5	7
Doctor 5	2009	1	3	4	3	1	3	2	6	2	6	6	9
	2010	1	2	2	2	1	2	2	2	2	4	4	4
	2011	1	1	1	1	1	2	2	2	2	3	3	3
Doctor 6	2009	1	1	†	†	1	2	†	†	2	3	†	†
	2010	1	1	5	3	2	6	3	7	3	7	8	10
	2011	1	1	1	†	1	4	3	†	2	5	4	†

† There were no patients of the treating doctor within the group for the statistical analysis.

with the anomalies of the external genitals (group II) 7 days, patients with the anomalies of the upper urinary tract (group III) 6 days, and patients with associated anomalies (group IV) 7 days.

The mean duration of hospitalization of all patients according to the treating physician during the study period is showed in the Table I. Observing the mean total length of the hospitalization of the patients with the anomalies of the testes (group I), *Doctors 1, 2* and *4* decreased the length of hospitalization of their patients from 2009 to 2011. The mean length of hospitalization of the patients from the group I of *Doctor 5* was the same over the three observed years (2 days), which was the shortest comparing to the other treating physicians. Patients from the group I of *Doctor 3* and *6* had the shortest mean length of hospitalization in 2011 (2 days), compared to two previous years, but there was an increase from 2009 to 2010.

Monitoring the patients with anomalies of the external genitals (group II), *Doctors 1, 2, 4, 5* and *6* were reducing the length of hospitalization each year; even though *Doctors 1* and *5* had the largest number of patients, they had the shortest length of hospitalization during the study period. Patients of *Doctor 6* had the shortest average length of hospitalization in this group in 2009. Patients of *Doctor 3* had the longest average length in 2010.

All doctors were reducing the mean total length of hospitalization in patients with the upper urinary tract anomalies (group III) each year, and *Doctors 1* and *5* had the shortest length of hospitalization among this group of patients.

Doctors 2, 4 and *5* showed a noticeable decrease in mean length of hospitalization per year in patients with associated anomalies (group IV).

Patients from group III and IV from *Doctor 6* did not get into the statistical analysis for 2009, because *Doctor 6* had no patients within these groups.

We emphasize that in all groups, for all physicians, extreme values were used proportionally to the number of patients within the four groups of patients.

Using Analysis of variance (ANOVA) we evaluated the difference between the lengths of hospitalization of all patients of all six physicians. We found a statistically significant difference in total length of hospitalization of the patients with anomalies with the testes (group I). T test was used to confirm that the shortest length of hospitalization was observed in *Doctors 1* and *5* ($F=10.36^{**}$ for $F_{0.05;5;12}=3.11$ and $F_{0.01;5;12}=5.06$).

Evaluating the difference in hospitalization length using ANOVA of all patients of all six physicians, there was a statistically significant difference in total length of hospitalization of the patients with the anomalies of the external genitals (group II). T test was used to confirm that the shortest duration of hospitalization was observed in patients from group II of *Doctor 1* and *5* ($F=17.01^{**}$ for $F_{0.05;5;12}=3.11$ and $F_{0.01;5;12}=5.06$).

It was not possible to perform ANOVA for the patients in the group with upper urinary tract anomalies (group III) and in patients with associated anomalies (group IV), because *Doctors 3* and *6* did not have a sufficient number of patients necessary for statistical analysis (Table II).

Discussion

Fast-track surgery concepts combine the use of minimally invasive surgical procedures, anesthesia, pain management and postoperative rehabilitation with the early patients' mobilization and oral feeding. The combination of these approaches reduces the stress response and organ dysfunction and significantly shortens the time needed for the full recovery. Length of hospitalization directly affects the cost of the treatment, the burden of hospital capacity and patient satisfaction.¹⁰ The progress in surgery and anesthesiology has enabled the development of new methods that can be used in pediatric urology, as well as in other areas of pediatric surgery in order to shorten hospital stay¹¹⁻¹⁴.

Some of the major surgical procedures in adult patients are performed according to fast-track surgery concept which is confirmed by series of studies with well documented records for safety and low morbidity, even in high risk patients^{3,4,15-17}.

In the majority of studies conducted on pediatric departments, especially on department of urology, in developed countries more than 50% of patients were successfully treated using the fast-track or out-patient concepts with no increase in risk of postoperative complications due to shorter hospitalization. The uses of minimally invasive procedures have been associated with the decrease of pain, inflammatory responses and immunodysfunctions¹⁸⁻²⁰.

According to the concept of fast-track surgery, the patient is hospitalized, operated on and discharged the same day. The psychological effects of hospitalization on children pose some behavioral problems after parental separation and therefore the admission of mother and child on a one-day surgery basis reduces psychological stress on children by decreasing hospitalization time.

Recent developments in techniques in anesthesia have optimized conditions for surgery, as well as for very early postoperative recovery of vital organ function following major procedures. After experimental studies showed that peripheral and central nervous system have a great role in endocrine response to stress, broad research has shown that regional anesthetics can reduce classic pituitary, adrenocortical and sympathetic responses to surgery^{2,21}. Optimal pain management of children undergoing fast-track surgical procedures is mandatory. Routine use of caudal block with long-lasting local anesthetic presents the basis of postoperative analgesia for children undergoing surgery. Opioid analgesic drugs are not routinely used especially because the possibility of nausea, vomiting, decrease of bowel movements and fatigue, which is in contrast to the concepts of the fast-track protocols. Additional analgesia should be discussed with the responsible anesthesiologist before administration of the analgesic drugs.

In our series, fast-track surgery concepts could be applied in a greater number of older children undergoing uro-

logical surgeries, which also corresponds to literature data^{7,11,22-24}.

Urogenital congenital anomalies were present with the ratio of 3.64:1 in our series of patients in favor of boys, which is in correlation with the literature data on gender distribution of congenital anomaly frequency.

A shortcoming of our study was the prolonged total length of hospitalization due to preoperative hospitalization of our patients for preoperative preparation, which is not necessary for fast-track surgery concept. Analyzing the length of hospitalization of the patients treated at the urology department, the tendency of shortening the total length of hospitalization was observed in all doctors in all patients' groups. The patients with the anomalies of the testes (group I) had the decrease in length of hospitalization from the mean stay of 4 days during 2009 to 2 days during 2011, with a very high statistical significance for *Doctors 1* and *5*, who also treated the majority of the patients in the study period (for $\alpha=0.01$). Patients with anomalies of the external genitals had a decrease of the mean hospital stay from 7 days during 2009 to 6 days during 2011, with noticeable decrease of hospital stay of patients treated by *Doctor 5* (3 days in 2011). Patients with the upper urinary tract anomalies (group III) had the mean hospital stay of 7 days in 2009, with the decrease to 6 days in 2010, and 5 days in 2011. The mean hospital stay of the patients with the associated anomalies (group IV) in 2009 was 9 days, in 2010 8 days, and in 2011 it was decreased to 6 days, applying the fast-track surgery concepts.

There were no complications related to fast-track surgery. Understanding of basic pathophysiological processes, and improvement in perioperative and postoperative patient care, has led to a reduced need for long hospitalization and faster recovery of surgical patients.

Based on experience, the standard urological surgery in children may be performed on a fast-track surgery basis, as safely as with the traditionally longer hospitalization, with significantly reduced costs, faster recovery and reduced stress for patients and their families.

Constant education of physicians in referent centers is needed in aim to shorten hospitalization length of the patients treated at pediatric urology. We intend to monitor the outcome of improved surgical and anesthesia techniques on new population of our patients which we plan to present in our future study.

Conclusions

Continuous advancements and exchange of experiences result in the improvement and better recognition of the fast-track surgery approaches, facilitating the process of acceptance and inclusion of these principles in surgical treatment into standard care in pediatric surgery. It also shows that these concepts do not depend on new, advanced equipment as is commonly thought in devel-

oping countries; it is rather a change in perception that is needed: shorter hospital stay, in applications such as these, does not endanger the patient; on the contrary, greater patient comfort yields faster, less traumatic recovery.

Riassunto

Scopo dello studio è quello di indagare la possibilità del concetto della fast-track surgery in un dipartimento di chirurgia pediatrica come singolo centro studi di un paese in via di sviluppo.

Lo studio è stato compiuto su 1620 pazienti sottoposti a terapia chirurgica nel dipartimento di urologia pediatrica dal 2009 al 2011, per patologia congenita. Tutti i pazienti sono stati aggregati ad uno di quattro sottogruppi: 1° anomalie del testicolo (197 pazienti); 2° anomalie dei genitali esterni (453 pazienti); 3° anomalie del tratto urinario superiore (801 pazienti); 4° anomalie associate (169 pazienti).

È stata analizzata la durata della degenza di tutti i pazienti in relazione a tutti i medici responsabili del trattamento specifico.

Sono state rilevate differenze statisticamente significative nella durata della degenza di tutti i pazienti del 1° gruppo tra il medico 1 e 5 ($F=10.36^{**}$ for $F_{0.05;5;12}=3.11$ and $F_{0.01;5;12}=5.06$), come pure nel 2° gruppo ($F=17.01^{**}$ for $F_{0.05;5;12}=3.11$ and $F_{0.01;5;12}=5.06$). Non è stato possibile effettuare una analoga valutazione statistica nei gruppi 3° e 4° per mancanza dei pazienti.

In rapporto alla durata della degenza dei pazienti trattati nel dipartimento urologico tutti i medici hanno mostrato una tendenza alla sua contrazione nei pazienti di tutti i gruppi. La maggioranza degli studi condotti nei dipartimenti di urologia pediatrica nei paesi a sviluppo avanzato dimostrano che più del 50% dei bambini vengono trattati con successo usando i concetti della fast-track surgery.

In conclusione i metodi moderni di anestesia e di trattamento chirurgico consentono un accorciamento dei periodi di degenza ospedaliera, un risparmio economico per l'intero sistema sanitario ed un migliore comfort per i pazienti

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