

# Importance of a Proper Planning of Surgical Procedures in Pediatric Laparoscopy. Theater Checklist

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## ABSTRACT

**Aims:** Ergonomics and proper planning of surgical procedures are the basis of success for laparoscopy in children. The successful execution of a laparoscopic procedure requires a great familiarity with the equipment and the positioning of the operators. This is to avoid unnecessary surgical team fatigue that affects the duration and effectiveness of the intervention. We conducted a study on our laparoscopic procedures to determine the effectiveness and usefulness of the application of ergonomics and a regular use of a preoperative checklist. **Materials and Methods:** We studied the laparoscopic operations performed by a single operator between January 2008 and July 2011. These factors were considered: the position and orientation of equipment, crew and patient discomfort, and the problems encountered by the operators. We used as evaluation criteria the diagrams proposed by Lenoir and Steinbrecher and an appropriate preoperative checklist. **Results:** Of the 49 measures considered, only 22 procedures were useful and met the evaluation criteria. No correlation, referring to the physical measures, were detected in operations lasting <60 minutes. The fatigue of the operating team grew, even if non-exponentially, after the first hour of operation. In the 22 procedures considered, there were 71 “adverse” episodes that delayed or complicated the procedure; most of these were related to inadequate preparation of the operating room, instruments, or operators (malfunction of synthesis equipment, unavailability of instruments, insufficient number of principals, malposition of trocars, or unavailability of image intensifier). After the adoption of checklist, verified in the subsequent 18 procedures, only 10 adverse episodes occurred. **Conclusions:** Our study seems to confirm that simple steps related to proper planning of laparoscopic procedures were directly linked to the effectiveness of surgical performance and duration of the intervention. The preoperative checklist we set, in our experience, resulted as very useful in preventing intra-operative problems.

**Keywords:** Ergonomics; Checklist; Laparoscopy; Children

## 1. Introduction

The proper planning of surgery is part of the larger sphere of prevention of errors in surgery [1]. In a study in which the Clavien system [2] was used it resulted that most of the errors found (69.5%) were of little or no consequence and did not cause harm to the patient, but certainly caused stress to the surgeon and the operating team: in the final analysis they can influence the surgical performance [3]. This is particularly important in (mainly pediatric) laparoscopic surgery, where gradually more complex technologies impose an increasing degree of attention.

Concerned by medical errors, Atul Gawande, in his bestseller “The Checklist Manifesto”, has investigated the nature of the failures that plague medicine and has found that as our lives and our work become more complex—An inevitable side effect of technological development—The easier it is to overlook details, sometimes with catastrophic results. That is why checklists are in-

dispensable [4,5].

The purpose of our study was to verify whether the adoption of a laparoscopic checklist specifically prepared for common pediatric laparoscopic procedures can improve the theater performance. In agreement with that proposed by the WHO, in formulating our checklist, we have tried to draw up a short, concise, and easy to compile document from medical and nursing staff [6].

We considered also that there are currently no standardized checklists for use in pediatric laparoscopy.

## 2. Materials and Methods

We studied the laparoscopic operations performed by a single operator between January 2008 and July 2011. Out of a total of 49 interventions taken into account, only in 22 was it possible to complete the controls in order to highlight the adverse episodes that occurred during the intervention. They were:

4 Bilateral Inguinal Hernia Repairs,

- 5 Acute Appendectomies,
- 6 Left Palomo Varicocelectomies,
- 1 Hemiureteronephrectomy,
- 4 Cholecystectomies,
- 1 Laparoscopic Pyeloplasty,
- 1 Georgeson—De La Torre,

We considered: The position and orientation of equipment, crew discomfort, and the problems encountered by operators. At this stage the staff was not aware of the study.

In the second phase of the study we set a laparoscopic checklist based on adverse episodes recorded in the 22 previous procedures, which, this time, was shared with the nurses and the surgeons (Figure 1).

The 18 procedures in which it was possible to rigorously apply the checklist, were as follows:

- 3 Bilateral Inguinal Hernia Repair,
- 5 Acute Appendectomies,
- 4 Left Palomo Varicocelectomies,
- 1 Left Hemiureteronephrectomy,
- 1 Laparoscopic Pyeloplasty,
- 1 Nephrectomy,
- 2 Cholecystectomies,
- 2 Cholecystectomies,
- 1 Laparoscopic Orchidopexy,

The adverse episodes registered before and after the adoption of checklist are summarized in Table 1.

**Table 1. Shows the adverse episodes registered before and after the adoption of checklist.**

Adverse episodes	Before	After
Image intensifier	4 (2 malfunction, 1 unavailability, 1 delay technician)	-
Devices	26 (9 Non-operation Alarm, 12 footswitch displaced, 5 handle not working)	2 (1 footswitch displaced, 1 handle not working)
Instruments	27 (3 Scissors not cutting, 2 Breaking the grip of the needle-holder, 11 no spare instruments, 2 locked cupboard, 1 absence of the responsible, 6 Gas leak from the seal of the trocar, 2 Suction not working)	4 (1 Scissors not cutting, 1 no spare instruments, 1 Locked cupboard, 1 Gas leak from the seal of the trocar)
Trocars malposition	3 (Azimuthal angle incorrect)	1 (Azimuthal angle incorrect)
Insufficient number of principals	12 (Scalpels unsuitable, inadequate stitches, coagulator unregulated, catheter not in place, venous line wrong side)	3 (Scalpels unsuitable, inadequate stitches, coagulator unregulated, catheter not in place, venous line wrong side)

CHECKLIST PEDIATRIC LAPAROSCOPY

Patient's Name: \_\_\_\_\_ B.D. \_\_\_\_\_ Age: \_\_\_\_\_ BW: \_\_\_\_\_

Informed consent OK

Pathology \_\_\_\_\_ Side: Left  Right

Surgery: \_\_\_\_\_

Surgeons: \_\_\_\_\_ Nurses \_\_\_\_\_

Preoperative Briefing

Set up

Approach: Retroperitoneum  Peritoneum  Thorax  Bladder



Set up:

Catheter

Blood

INSTRUMENTS

L. Tower Checked

Optic: 5mm  10mm  0°  30°  Other

Trocars: Standard 2mm  3mm  5mm  10/12 mm

Rescable 3mm  5mm  10/12 mm

Special mm N..... mm N.....cm

(a)

Devices:

Image Intensifier  Checked

Coagulation: Monopolar  Bipolar  LigaSure  Harmonic

Footswitch: Checked  Left  Right

Stitches: Standard  Slide needle \_\_\_\_\_

Absorbable  No..... Not absorbable  No.....

INSTRUMENTS: Needle Holder N.....

MARYLAND N.....

SCISSORS Straight N..... Curve No.....

Hook N.....

Johann N.....

Grasper N.....

Loops N.....

Bag N.....

Clips 5 mm  10 mm  Stapler  n.....

Retractor

Aspirator

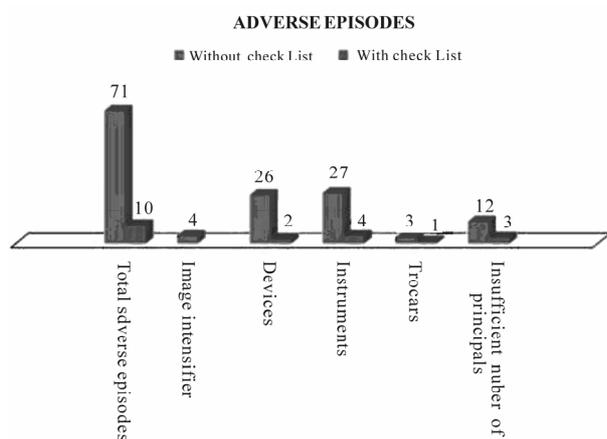
Spare instruments:

Remarks.....

Date..... Signature \_\_\_\_\_

(b)

**Figure 1. The theater checklist set for this study.**



**Figure 2.** Graph showing the adverse episodes before and after the adoption of theater checklist.

The graph shows the results (**Figure 2**).

At the end of this experimental phase we distributed a questionnaire containing short questions to four doctors (1 senior registrar and 4 residents), and the three fixed operating room nurses:

- if they considered the adoption of the checklist useful;
- if they considered the results satisfactory;
- if, in their opinion, the work was less fatiguing;
- if they wanted to continue to use the checklist.

### 3. Results

Only 10 adverse episodes have been recorded, significantly below the 71 episodes recorded before the adoption of the checklist. The questionnaire responses were unanimously positive, both by doctors by nurses.

Although it was not possible to quantify the result, the implementation of preoperative briefings and completing the checklist has been recognized by all members of the team, surgeons and nurses, a valuable tool that has facilitated the tasks of everyone. Particularly appreciated was the entry concerning preoperative briefing.

### 4. Discussion

The first checklist was developed in aviation in 1935 to allow the continued flying of the prototype Boeing Model 299 of the American bombers B-17. Major Ployer Peter Hill and Boeing employee Les Tower took the Model 299 on a second evaluation flight and, inadvertently, the crew forgot to disengage the “gust locks”, a system of devices that held the bomber’s movable control surfaces in place while the aircraft was parked on the ground. After take-off, the aircraft entered a steep climb, stalled, nosed over, and crashed, killing Hill and Tower (other observers survived with injuries). From then on there has been no flight that hasn’t used a checklist [7].

Based on the recommendations of Guidelines for Sur-

gery, after careful study and overcoming much resistance, in 2009 the WHO built a checklist for safety in the operating room containing 19 items, as a tool to guide the implementation of controls to support the operating team, with the purpose of systematically promoting adherence to the implementation of recommended safety standards to prevent mortality and post-operative complications [6].

We believed that the integration with a theater checklist just intended for the operations of pediatric laparoscopy could be useful and could fit to the recommendations of WHO.

The report of Lenoir and Steinbrecher [8], first poses the problem of a preoperative pediatric checklist for surgeons and nurses after a complex examination of problems related to pediatric laparoscopy. The Authors studied the organization of the surgeries taking into account factors related to ergonomics, fatigue of operators, the organization of the operating room and instrumentation demonstrating that proper planning of interventions improves the performance of the operators and the results.

This was followed by other studies but, at the present, there is still no a standardized checklist for pediatric laparoscopy that meets the criteria of conciseness, convenience, and ease of compilation, although recent studies do suggest such application [9].

The preoperative checklist we set seems to meet the above mentioned criteria and, in our experience, resulted as very useful in preventing intra-operative problems.

### 5. Conclusion

In conclusion our results, although promising, are based on a small number of patients and further studies and a greater number of patients are needed to confirm these results, but in any case we are firmly convinced that the checklist should be considered an important element in an increasingly complex organization for prevention of errors in surgery.

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