



Improving Healthcare Workers' Adherence to Surgical Safety Checklist: The Impact of a Short Training

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Background: Although surgery is essential in healthcare, a significant number of patients suffer unfair harm while undergoing surgery. Many of these originate from failures in non-technical aspects, especially communication among operators. A surgical safety checklist is a simple tool that helps to reduce surgical adverse events, but even if it is fast to fill out, its compilation is often neglected by the healthcare workers because of unprepared cultural background. The present study aims to value the efficacy of a free intervention, such as a short training about risk management and safety checklist, to improve checklist adherence.

Methods: In March 2019, the medical and nursing staff of the General Surgical Unit attended a two-lesson theoretical training concerning surgical safety and risk management tools such as the surgical safety checklist. The authors compared the completeness of the surgical checklists after and before the training, considering the same period (2 months) for both groups.

Result: The surgical safety checklists were present in 198 cases (70.97%) before the intervention and 231 cases (96.25%) after that. After the training, the compilation adherence increased for every different type of healthcare worker of the unit (surgeons, nurses, anesthetists, and scrub nurses). Furthermore, a longer hospitalization was associated with a higher surgical checklist adherence by the operators.

Conclusions: The results showed that a free and simple intervention, such as a two-lesson training, significantly stimulated the correct use of the surgical safety checklist. Moreover, the checklist adherence increased even for the operators who did not attend the training, maybe because of the positive influence of the colleagues' positive behaviors. As the results were promising with only two theoretical lessons, much more can be done to build a new safety culture in healthcare.

Keywords: surgical safety checklist, risk management, clinical governance, safety culture, patient's safety

INTRODUCTION

The operating room is a complex system that involves many professionals with different technical tasks. An incompressible risk for the patient is inherent in any type of surgery (especially in emergency or urgent conditions), hence a significant number of patients suffer from harm while undergoing a surgical procedure (1). Around one in twenty patients are exposed to preventable harm, 10% of which was reported in surgery (2). Furthermore, although surgery is an essential resource for health care, the resources invested in it are often inadequate (3). In such a context of limited funds, a surgical error causing serious harm to the patient poses a medical liability issue as well as an ethical one.

The four most frequent consequences of surgical errors are surgical wound infection, anatomical dehiscence, deep venous thrombosis, and surgical mortality (4). This also means an increase in the length of hospitalization and costs. Many surgical adverse events originate from failures in non-technical aspects such as leadership, situation awareness, decision making, and especially communication and teamwork among operators (5, 6).

Some special incidents within healthcare have been included in a list known as “never events,” which are defined as wholly preventable serious healthcare-related adverse events (7). Regarding surgery, there are three such “never events,” all depending on non-technical aspects: wrong-site surgery, retained foreign object, and incorrect implant (8). Despite their name, the surgical “never events” still happen. Therefore, many attempts to improve communicative aspects of healthcare practice have been described in the literature. For example, in the Policlinico University Hospital of Bari (Italy), Ferorelli et al. tried to standardize the communication in handover by developing a handover checklist model, while in the Columbia University Medical Center of New York City, Nakagawa et al. had positive results by developing a 2-h communication skills training program for general surgery residents (9, 10).

A widely employed tool in error management is the checklist, a systematically arranged list of actions, steps, or objects, that allows the user to ensure that all the listed items are considered (11). In 2004, the WHO launched the program “Safe surgery saves life” to improve the safety of surgical care around the world by defining a core set of safety standards that can be applied in all countries and settings. The program regards the surgical checklist as essential and promotes its adoption worldwide (12, 13). Hynes et al., in 2009, demonstrated that the adoption of the surgical checklist reduced the rates of death and complications among surgical patients (14).

From 2013, in Apulia Region, Italy, the Units of Regional Health Service applied a revised surgical safety checklist (CL). The CL comprises four parts (called “times”: transfer, sign-in, time-out, and sign-out), each containing different sections that should be filled by every professional involved (surgeons, anesthetists, nurses, and scrub nurses). Still today, the CL is not drawn up regularly and completely, despite the simplicity of compilation and the commitment to include it into the medical records. The correct utilization of such instruments

partly depends on the safety knowledge and safety attitudes of healthcare workers (15).

The present study aims to measure the impact of the two-lessons training concerning risk management in healthcare. The authors verified the presence and completeness of CL in a third-level hospital after and before such intervention.

METHODS

Context

In March 2019, the Clinical Risk Board of the Apulia Region, together with the Clinical Risk Unit of a third level university hospital (Policlinico University Hospital of Bari, over 1,000 beds), set up an operative group that involved the medical and nursing staff of the General Surgery Unit, which aimed to promote surgical safety. In April 2019, the members of the operative group attended two theoretical lessons of 1.5 h each about surgical safety and the risk management tools held by an expert of the Clinical Risk Unit.

The General Surgery Unit of the Policlinico University Hospital of Bari (which had more than 1,000 beds) has 2 operating rooms and 25 beds. Ten physicians and 24 nurses worked in the unit.

Intervention

The program contained the following lessons:

- Ricks and safety in a complex system (first session)
- The risk management in healthcare (first session)
- Incident reporting and no-blame culture (second session)
- Clinical safety checklist: history and achievement of a safety tool (second session).

Every physician and nurse in the unit attended at least one of the lessons but the anesthetists and the scrub nurses did not because they rotate between the different surgery units. The authors valued the completeness of the CL in the General Surgery Unit after and before this intervention by checking the clinical records. The participants did not know about the study.

Study of the Intervention and Measures

First, the investigator retrospectively analyzed the clinical records of the 318 patients discharged before the operative group was activated (Before-training group: January 1, 2019–March 31, 2019). Then, the investigator collected the clinical records of the 280 patients discharged after the CL training (After-training group: April 1, 2019–June 30, 2019).

The recorded data for each patient were as follows: number of clinical records, date of surgical procedure (if performed), type of procedure, length of hospitalization, presence/absence of CL, and completeness of each different section. The completeness of the sections of CL and the presence/absence of CL were measured to assess the efficacy of the intervention in increasing adherence of operators to CL. The single section completeness was used to draw out the defaulting operator in order to measure the differences. The length of hospitalization and the type of surgery were measured to verify their eventual influence on CL adherence.

Abbreviations: CL, Surgical safety checklist.

TABLE 1 | Completeness of checklists.

Checklist	Before-training		After-training		<i>p</i> -value
Present	198	70.97%	231	96.25%	<0.01
Absent	81	29.03%	9	3.75%	<0.01
All	279		240		

Excel was employed for data collection, and the statistical analyses were performed by using R software (Pearson χ^2 test and Unpaired two-sample Wilcoxon test); $p < 0.05$ was considered significant.

Ethical Considerations

As no experimentations were conducted and no personal data were collected, according to the local regulation, the study did not require any approval from the Ethical Committee.

RESULTS

A total amount of 598 clinical records of the General Surgery Unit were analyzed. A total of 519 patients (89.79%) had surgery during their hospitalization, with 279 patients in the before-training group (87.74%) and 240 in the after-training group (85.71%) ($p = 0.47$).

According to the type of surgical procedure, the population was divided as follows: 161 patients (78 before-training and 83 after-training) had an intestinal operation; 117 patients (73 before-training and 44 after-training) had a breast operation; 99 patients (49 before-training and 50 after-training) had an hepatobiliary district operation; 45 patients (26 before-training and 19 after-training) had thyroid surgery; 24 patients (13 before-training and 11 after-training) had an operation for hernia; 22 patients (17 before-training and 5 after-training) had an esophagus or stomach surgery; and 51 patients (23 before-training and 28 after-training) had another type of operation ($p = 0.06$).

The CL was present (completely or partially filled) in 198 procedures (70.97%) in the pre-training group, and 231 (96.25%) in the after-training group ($p < 0.01$) (Table 1).

The CL was wholly filled in 57 cases (20.43%) in the before-training group and 105 (43.75%) in the after-training group ($p < 0.01$), while incompletely filled in 141 cases (50.54%) before the training and 126 cases (52.50%) after the training ($p < 0.01$). Among all the incomplete CL, it was pointed out which was the defaulting operator. The “transfer time” comprises one section for the surgeons and one for the nurses, while the “sign-in time,” the “time-out time,” and “sign-out time” contain one section for each of the surgeons, nurses, anesthetists, and scrub nurses. So, every CL contains 14 sections. All the professionals showed a significant increase in CL adherence (Table 2).

The length of hospitalization of each included patient was measured before and after the training. Both the before-training (median = 3; interquartile range: 2–6) and the after-training (median = 4; interquartile range: 2–7) groups have a similar non-parametric distribution of length of hospitalization ($p = 0.72$).

Considering all patients, the hospitalization is significantly longer when the CL is present (Median = 3; interquartile range: 2–7) than when it is absent (median = 2; interquartile range: 2–5) ($p < 0.01$) (Table 3).

DISCUSSION

The present study was aimed to value the efficacy of a simple intervention promoting CL adherence. The authors valued the presence and the completeness of the CL in the clinical records of patients discharged from the General Surgery Unit before (before-training group) and after (after-training group) that operators attended a short training about surgical risk management and the use of CL. According to the results, the CL was often incomplete or absent.

Studying adherence to the CL may help to understand how to improve such risk management tools. According to a Brazilian study, the American Society of Anaesthesia score (ASA score) and the length of hospitalization of each patient may influence CL adherence (16). The ASA score provides a baseline metric for the fitness of a patient before undergoing surgery in addition to predicting mortality (17). Similarly, the length of hospitalization is partially a function of patient and disease factors (18). The before-training and after-training groups have similar numbers and types of surgeries performed and length of hospitalization.

The present study noticed a positive association between the length of hospitalization and CL adherence for both after-training groups and before-training groups. A hypothesis may be that the operators believe that those patients with bad fitness and a high length of hospitalization have an elevated risk of experiencing adverse events, causing them to be more careful about safety tools. Hence, even if every patient requires to be treated in a safe condition, and the CL is quite simple and fast to fill out, as suggested by Weaver et al., the shared (and maybe insufficient) safety culture seems to shape the perception of health operators about “normal” behavior related to patient safety and appears to be change-resistant (19). Therefore, it is essential to ceaselessly carry out proactive clinical risk management in order to achieve a new safety culture in healthcare (20).

After the training, it was observed that there was a sharp increase of present CL (from 70.97 to 96.25%). The wholly filled CL increased from 20.43 to 43.75%, and there was a slight increase of incomplete CL (from 50.50 to 52.50%). Even if those results were promising, similar studies reported even better ones (16, 21).

Among all sections of CL, it was possible to identify which operator was the defaulting one. It was just the surgeons and nurses who attended the lessons, as the anesthetists and scrub nurses were not assigned to the General Surgery Unit as they rotated among the different surgical units. Notwithstanding this, all the professionals showed a significant increase in CL compliance. A hypothesis is that the non-trained operators were influenced by the positive behaviors of their colleagues. It means that a simple intervention such as the short theoretical training stimulated a behavioral change that can may be “self-feed.”

TABLE 2 | Incomplete checklist per operator.

Checklists' section	Before-training		After-training		p-value
	Filled (%)	Not Filled (%)	Filled (%)	Not filled (%)	
S	556 (50.27)	550 (49.73)	861 (89.69)	99 (10.31)	<0.01
N	714 (63.98)	402 (36.02)	874 (91.04)	86 (8.96)	<0.01
A	455 (54.36)	382 (45.64)	554 (76.94)	166 (23.06)	<0.01
SN	513 (324)	324 (38.71)	604 (83.89)	116 (16.11)	<0.01

S, surgeon; A, anesthetist; N, nurse; SN, scrub nurse.

TABLE 3 | Length of hospitalization (days).

Group	Median (interquartile range)	p-value
Before-training	3 (2–6)	0.72
After-training	4 (2–7)	
All patients – CL present	3 (2–7)	<0.01
All patients – CL absent	2 (2–5)	

CL, checklist.

In conclusion, as shown by several authors, CL compliance is essentially a cultural issue (22–24). Educate the healthcare workers is necessary in order to achieve a new safety culture and a more general no-blame culture (25). The increase in CL adherence is indeed demonstrated to have a positive association with the reduction of complications, morbidity, and mortality after surgery (26–29). It also means a reduction in costs for the healthcare system through different mechanisms. A reduction of direct costs of beds and therapies, the decrease of adverse events, and the better quality of documentation in clinical records could ensure savings in medical liability costs (30).

The main limitation of the study is that just a few healthcare workers participated in it. Moreover, other clinical data might be considered as variables. Another limitation is the lack of depth analysis of the specific cultural context. The main strength is that the participants did not know about the study.

The next step will be to involve all the professional figures in the training and find new trainers among the training

participants (including nurses and anesthetists) to actively involve the operators in risk management. Any clinical and economic results must be longitudinally monitored over time to be able to attract investments in clinical risk governance. The present study reported a significant increase in CL compliance obtained with a short training. To ensure CL adherence among healthcare operators means to promote a new safety culture and to require both an “external” intervention (such as CL training) and an “internal” one (by actively involving operators as trainers).

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

DF conceptualized the study and wrote the original draft. MB was responsible for data curation and analysis. LD, AC, LS, and FZ collaborated in investigation and data collection. LV and GM lead writing, reviewing, and editing. AD and BS supervised the research project. All authors have read and agreed to the published version of the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2021.732707/full#supplementary-material>

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