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SHORT COMMUNICATION

Improvement of teamwork and safety climate following implementation of the WHO surgical safety checklist at a university hospital in Japan

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Abstract With the aim to optimize surgical safety, the World Health Organization (WHO) introduced the Surgical Safety Checklist (SSCL) in 2008. The SSCL has been piloted in many countries worldwide and shown to improve both safety attitudes within surgical teams and patient outcomes. In the study reported here we investigated whether implementation of the SSCL improved the teamwork and safety climate at a single university hospital in Japan. All surgical teams at the hospital implemented the SSCL in all surgical procedures with strict adherence to the SSCL implementation manual developed by WHO. Changes in safety attitudes were evaluated using the modified operating-room version of the Safety Attitudes Questionnaire (SAQ). A before and after design was used, with the questionnaire administered before and 3 months after SSCL implementation. Our analysis revealed that the mean scores on the SAQ had significantly improved 3 months after implementation of the SSCL compared to those before implementation. This finding implies that effective implementation of the SSCL could improve patient outcomes in Japan, similar to the findings of the WHO pilot study.

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Despite advances in medical technology and surgical techniques, there is an ongoing need to optimize the quality of surgical care and patient safety [1]. This need to improve the safety of surgical is the framework within which the World Health Organization (WHO) developed a Surgical Safety Checklist (SSCL). Most importantly, an initial pilot study demonstrated a greater than one-third reduction in surgical morbidity and mortality following the implementation of the SSCL [2], with the results of several clinical trials that followed further confirming the global efficacy and applicability of the SSCL [3–5]. On the basis of these findings, WHO has recommended the use of the SSCL in all surgical procedures and, consequently, the SSCL has been adopted in a large number of hospitals worldwide.

However, the implementation rate of the SSCL is still relatively low in Japan (WHO Surgical Safety Website: http://maps.cga.harvard.edu:8080/Hospital/). One possible reason for this apparent wait-and-see attitude is the lack of empirical evidence on the efficiency of the SSCL in Japan. Consequently, hospital staff may not realize the benefits of implementing the SSCL. In order to effectively implement the SSCL in hospitals, "explaining why" may be the one essential component [6]. Previous studies have indicated that positive changes in teamwork and safety climate play a pivotal role in the improvement of surgical outcomes [7]. Therefore, we have investigated whether implementation of the SSCL actually did improve the teamwork and safety climate in the operating room at Kochi Medical School Hospital.

This study was approved by the Ethics Committee of Kochi Medical School Hospital. Similar to the WHO pilot study, a before and after intervention design was used. Before SSCL implementation, in accordance with the hospital's baseline safety policies in the operating room, a member of the surgical staff routinely performed oral confirmation of the patient's identity, of the surgical methods, and of the blood transfusion order—but not of other SSCL items, including a formal team briefing. The introduction of the SSCL at the hospital was carried out in accordance with the WHO Implementation Manual (2009; http://www.safesurg.org/implementation-manual.html). All of the steps and checklist items recommended by WHO were included, and a check-off box for deep vein thrombosis prophylaxis was added before induction of anesthesia. Implementation processes, including formation of a multidisciplinary team, translation, making a "How-to" video, small simulation testing, and several information sessions, were performed during the period of 2 months before the hospital-wide rollout. The SSCL was implemented for all operations on September 18, 2012 and remains currently in place.

Changes in teamwork and safety climate after SSCL implementation were evaluated using a modified operating room version of the Safety Attitudes Questionnaire (SAQ) according to previous studies [7, 8]. We used a 12-item questionnaire that focused on two key domains associated with effective implementation of the SSCL: teamwork and safety climate. All questionnaires were translated into Japanese through a three-stage process. First, two investigators (TK and MT) independently translated the original SAQ into Japanese. These two forward translations were then reconciled into one common translation after all discrepancies had been resolved by consensus. Second, two English native speakers translated the Japanese version of the SAQ back into English. For cross-cultural adaptation, any disagreement between the original SAQ and the back-translation were discussed, which ultimately led to a revised version. Finally, the revised version was tested on a sample of operating teams ($n = 5$) ,and some minor changes were made to develop a final version. All members of the medical staff working in the operating room for at least 1 month prior to the administration of the questionnaire were invited to participate in the study. The participants included surgeons, anesthesiologists, and nurses. The questionnaire was distributed before and 3 months after SSCL implementation (pre- and post-intervention) through hand delivery, and response was voluntary.

The five-point Likert scale (1 = disagree strongly, 2 = disagree slightly, 3 = neutral, 4 = agree slightly, 5 = agree strongly) was used to score each of the 12 items. Negatively worded items were reverse scored so that their valence matched the positively worded items. Mean SAQ scores used in quantitative analyses ranged from 0 to 5, with higher scores indicating better teamwork and safety climate. Results were presented as the mean ± standard deviation (SD) and statistically analyzed using the statistical program SPSS ver. 11.5 (SPSS Corp., Chicago, IL) The Wilcoxon rank-sum test was used to compare the SAQ scores of participants before and after implementation of the SSCL. Statistical significance was based on p values of <0.05.

Table 1 Demographics of the respondents

Demographics of the respondents	Valid responses	
	Pre-intervention survey ($n = 178$)[a]	Post-intervention survey ($n = 162$)[b]
Job type		
Anesthesiologist	10.7 % ($n = 19$)	11.1 % ($n = 18$)
Surgeon	19.8 % ($n = 35$)	21.0 % ($n = 34$)
Nurse	69.5 % ($n = 123$)	67.9 % ($n = 110$)
Sex		
Male	37.9 % ($n = 67$)	37.7 % ($n = 61$)
Female	62.1 % ($n = 110$)	62.3 % ($n = 101$)
Professional experience (in years)		
<2	11.9 % ($n = 21$)	12.3 % ($n = 20$)
2–10	55.4 % ($n = 98$)	55.6 % ($n = 90$)
≥10	32.8 % ($n = 58$)	32.1 % ($n = 52$)

[a] Survey carried out using the Safety Attitudes Questionnaire (SAQ) prior to implementation of the World Health Organization's Surgical Safety Checklist (SSCL)

[b] Survey carried out using the SAQ 3 months after SSCL implementation

The number of valid responses was 177 in the pre-intervention survey (overall response rate 86.8 %) and 162 in the post-intervention survey (overall response rate 79.4 %). The response rates were comparable among job types in the operating room. Detailed information on the baseline demographics of the respondents is summarized in Table 1.

The observance rate during the 3 months after implementation of the SSCL was 94.7 %. SAQ scores before and after SSCL implementation are presented in Table 2. The mean SAQ scores for all 12 items were higher in the post-intervention survey than in the pre-intervention survey. The overall SAQ score improved from 3.39 to 3.57 after SSCL implementation. Internal consistency of the SAQ was assessed with a Cronbach alpha value that was calculated to be 0.749 ($\alpha > 0.60$ considered robust).

Team communication among hospital healthcare professionals is critically important to ensure patient safety [9]. In this context, the SSCL is practically designed to not only prevent the accidental omission of critical steps, but also to improve communication in the operating room [2].

Table 2 Changes in SAQ scores before and after implementation of the SSCL

Item on the SAQ	SAQ score		*p* value
	Before	After	
1. I would feel safe being treated here as a patient	3.62 (0.99)	3.72 (0.87)	0.17
2. I receive appropriate feedback about my performance	3.19 (0.83)	3.24 (0.80)	0.47
3. In the OR, it is difficult to discuss errors[a]	3.40 (0.89)	3.68 (0.84)	<0.05
4. Briefing OR personnel before a surgical procedure is important for patient safety	3.53 (0.88)	3.64 (0.79)	0.37
5. I am encouraged by my colleagues to report any patient safety concerns I may have	3.42 (0.96)	3.55 (0.83)	0.15
6. The culture in the ORs here makes it easy to learn from the errors of others	3.19 (0.89)	3.37 (0.82)	<0.05
7. In the ORs here, it is difficult to speak up if I perceive a problem with patient care[a]	3.76 (0.78)	4.04 (0.81)	<0.05
8. I know the proper channels to direct questions regarding patient safety in the ORs here	2.70 (1.13)	3.08 (1.14)	<0.05
9. Disagreements in the ORs here are resolved appropriately	3.28 (0.96)	3.38 (0.93)	0.48
10. I have the support I need from other personnel to care for patients	3.63 (0.88)	3.77 (0.84)	0.23
11. It is easy for personnel in the ORs here to ask questions when there is something that they do not understand	3.55 (0.91)	3.64 (0.89)	0.29
12. The physicians and nurses here work together as a well-coordinated team	3.44 (0.82)	3.86 (0.79)	<0.05
Total	3.39 (0.95)	3.57 (0.90)	<0.05

OR operating room

Data for the SAQ score are presented as the mean with the standard deviation given in parenthesis

[a] Reverse worded and reverse scored, so that a higher score always indicates a better safety state

In our study, the SSCL was implemented in all surgical procedures in a university hospital in Japan. The data show a significant improvement in teamwork and safety climate by 3 months following SSCL implementation.

The initial pilot study of the SSCL was conducted at eight hospitals in eight countries (Canada, England, India, Jordan, New Zealand, the Philippines, Tanzania, and the USA), and the results demonstrated that effective implementation of the SSCL could reduce surgical morbidity and mortality [2]. The mechanism behind this improvement still remains unclear. However, since a number of surgical errors are due to communication failures, effective communication within a professional team and between team members must be a key component of surgical safety [10]. In fact, further analysis of the WHO pilot study showed that the degree of increase in SAQ scores was positively correlated with the magnitude of reduction in the complication and mortality rates [7]. Thus, positive changes in SAQ scores can be a benchmark of effective implementation of the SSCL. At the hospital which is the subject of this study, the average baseline SAQ score (3.39) was lower than that of the WHO pilot study (3.91). However, average changes following SSCL implementation were comparable: the mean increase rate in the overall SAQ score was 0.18 at the subject hospital, while it was 0.10 in the WHO pilot study. This finding implies that effective implementation of the SSCL may result in an improvement in surgical outcomes at the subject hospital similar to those observed in the WHO pilot study.

The SAQ is a survey which includes the dimension of human factors and has been extensively validated in different healthcare settings; it can also be used to monitor change over time [11]. In our study, the original English language version of the SAQ (consisting of 12 items related to the domains of teamwork and safety climate) was translated into Japanese and used as a tool to evaluate teamwork and safety climate. The values of Cronbach's alpha indicate that all 12 dimensions showed acceptable reliability. In addition, the high response rate in both the before and after survey indicate good acceptability. The positive responses to the intervention of the SSCL may further reflect the validity of the Japanese version of the SAQ in assessing the safety climate in the operating room.

There are some limitations that need to be addressed in future research considerations in this area. First, our study did not directly address the surgical outcomes, such as surgical wound infection, anastomotic leak, deep vein thrombosis, and surgical mortality, due to the lack of an accurate measurement and monitoring system of surgical adverse events at the subject hospital, a situation common at other institutions in Japan. However, further study is needed to determine the direct effects of the SSCL

implementation on clinical outcomes. Second, we developed a Japanese version of the modified operating room version of SAQ by performing cross-cultural adaptation that included the forward-translation, synthesis, back-translation, review, and pre-testing. However, consultation with the original developer of the SAQ was not undertaken, which might have led to a lack of conceptual equivalence with the original version [12]. Finally, the survey was conducted as a before and after intervention study. Therefore, due to the absence of a non-implementation group, the results may have been affected by factors other than the intervention itself, such as testing effect and/or maturation effect. However, a comparison of the changes in SAQ scores can be made with the results from the WHO pilot study, which employed a similar before and after study design [7].

In conclusion, the results of our study show that the SSCL was adaptable and suitable for improving the surgical safety attitudes at a university hospital in Japan. Although further multicenter and better controlled studies are needed to confirm the SCCL's effectiveness, emerging evidence indicates that the increase in safety scores may be linked to the reduction in postoperative morbidity and mortality. Our hope is that our findings will motivate other Japanese hospitals to use the SSCL.

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