World Health Organization Surgical Safety Checklist: Compliance and Associated Surgical Outcomes in Uganda's Referral Hospitals

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BACKGROUND: A pilot study on the World Health Organization (WHO) Surgical Safety Checklist (SSC) showed a reduction in both major complications and mortality of surgical patients. Compliance with this checklist varies around the world. We aimed to determine the extent of compliance with the WHO SSC and its association with surgical outcomes in 5 of Uganda's referral hospitals.
METHODS: A multicentre prospective cohort study was conducted in 5 referral hospitals in Uganda. Using a questionnaire based on the WHO SSC, patients undergoing surgical operations were systematically recruited into the study from April 2016 to July 2016. The patients were followed up daily for 30 days or until discharge for the purpose of documentation of complications. Logistic regression and linear regression were used to assess for association between compliance and perioperative surgical outcomes.
RESULTS: We recruited 859 patients into the study. Overall compliance with the WHO SSC was 41.7% (95% confidence interval [CI], 39.7–43.8) ranging from 11.9% to 89.8% across the different hospitals. Overall compliance with "sign in" was 44.7% (95% CI, 43–45.6), with "time out" was 42.0% (95% CI, 39.4–44.6), and with "sign out" was 33.3% (95% CI, 30.7–35.9). There was no association between compliance and perioperative surgical outcomes: length of hospital stay, adverse events, and mortality.
CONCLUSIONS: This study revealed low levels of compliance with the WHO SSC. There was a statistically significant association between this level of compliance and the incidence of pain and loss of consciousness postoperatively. (Anesth Analg 2018;127:1427–33)

KEY POINTS

- **Question:** What is the extent of compliance with the World Health Organization Surgical Safety Checklist and the association of this compliance with perioperative surgical outcomes in Uganda's referral hospitals?
- **Finding:** Compliance was low and varied across the different hospitals and there was no association between compliance and perioperative surgical outcomes.
- **Meaning:** While the compliance with the World Health Organization Surgical Safety Checklist was unacceptably low, the findings did not show any significant association between compliance and perioperative surgical outcomes.

Hospital-associated adverse events involving patients has been estimated at 10%, many of which are preventable.[1] A systematic review that included 8 studies from high-income countries showed that 1 in every 150 patients admitted to a hospital dies as a consequence of an adverse event and that nearly two-thirds of in-hospital events are associated with surgical care.[2]

The World Health Organization (WHO) drew lessons from aviation experience[3] and introduced the 19-item WHO Surgical Safety Checklist (SSC) in a bid to reduce the incidence of perioperative adverse events. The use of this checklist in 8 hospitals around the world was associated with a reduction in major complications and mortality by 4% and 0.7%, respectively.[4] Further study demonstrated that surgical checklists, when properly implemented, can make a substantial difference to patient safety and aid in reducing the incidence of adverse surgical events.[5,6]

In the United Kingdom, hospital audit data showed high compliance rates, but direct observation suggested that actual performance may be suboptimal and therefore it remains unclear whether the benefits obtained were through actual completion of a checklist or from an increase in overall awareness of patient safety issues.[7] Lilaonitkul et al[8] demonstrated a strong association of WHO SSC use with the performance of the instrument count in Mbarara Regional Referral Hospital. However, there are limited data regarding compliance with the WHO SSC and its association with postoperative outcomes in low-income countries and lower-middle–income

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countries. Therefore, we aimed to determine the extent of compliance with the WHO SSC and its association with surgical outcomes in 5 of Uganda's referral hospitals.

Rationale

The purpose of the study was as follows:

1. To determine compliance with the WHO SSC
2. To determine the relationship between compliance with the WHO SSC and perioperative surgical outcomes in Uganda's referral hospitals.

These data will be used as a reference for future research, monitoring, and evaluation of the WHO SSC, as well as for quality improvement projects in Uganda and Africa at large.

METHODS

Study Area and Setting

A multicentre prospective cohort study was conducted in 5 of Uganda's referral hospitals over a 4-month period (April 2016 to July 2016).

The hospitals were chosen purposively based on geographic location and the presence of an anesthesiologist at the time of protocol development. We chose 5 referral hospitals, each representative of one of the regions in Uganda with bed capacities ranging from 350 to 1500. They are equipped to perform both major and minor surgery.

Study Population

Ethical approval was sought from the Makerere University School of Medicine Research and Ethics Board, Uganda National Council of Science and Technology and the participating hospitals' ethics boards. Written informed consent was obtained from all study participants. The study participants were enrolled systematically into the study by probability proportional to the size sampling. All patients undergoing surgical operations were recruited into the study regardless of their age, surgical specialty, and the urgency of the surgical operation provided consent to participate in the study was given. Of the 16 referral hospitals in Uganda, 5 hospitals met the inclusion criteria and participated in the study. The Figure illustrates this. It was explained to the hospital directors that participation in the study was free of repercussions such as denial of services from the Ministry of Health and other service providers or victimization regardless of the study findings. If a significant adverse event was identified by the researchers, this was reported to the hospital director who was then expected to handle the matter in confidence. Hospitals remained anonymous to prevent victimization of the hospitals as this was a compliance study. In a bid to prevent the Hawthorne effect, only the institutions' directors were told the purpose of the study and the rest of the institution was blinded to the true purpose of the study. We found that the hospitals had used WHO SSC as is with no local modifications contrary to the suggestion from the WHO. The sample size was calculated using the modified Kish and Leslie method (1965) with a 95% confidence interval (CI) and powered at 80%. We considered that 50% of the study population had poor compliance with the SSC because we could not find previous studies assessing compliance with the SSC. This proportion was obtained from the WHO recommendation when no previous proportions

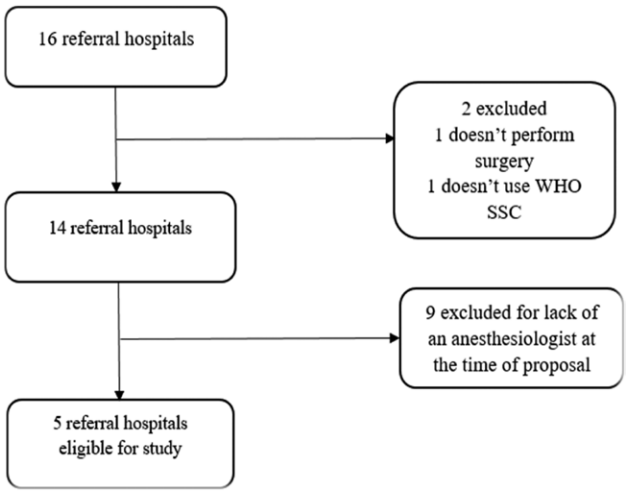

Figure. Flow diagram showing hospital sampling. SSC indicates Surgical Safety Checklist; WHO, World Health Organization.

are available. Because our study was done among several centers, we applied a WHO standard design effect of 2 which doubles the sample size. In addition, we added a 10% increase in sample size to cater for any losses to follow-up. The resulting sample size was 845.

Study Procedure

We trained nurses and intern doctors as research assistants. They were present in the operating room and observed the activities in the room throughout the surgery and completed a structured questionnaire regarding demographics, the 19 parameters and 3 domains of the WHO SSC, near misses, and intraoperative variables. Compliance was expressed as the percentage of items that were completed per checklist. Technical and intraoperative complications were recorded as well. The patients were followed up and questioned on the occurrence of complications at 24 hours and daily until discharge or 30 days postsurgery whichever came first. The nurses on the ward reported any immediate postoperative complications and the patient's charts were reviewed for documentation of complications. The complications were recorded as defined by the American College of Surgeons National Surgical Quality Improvement Program database. At the end of the follow-up period, the questionnaire was checked for completeness and accuracy before data entry.

This manuscript adheres to applicable Strengthening The Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Statistical Analysis

Data were analyzed using STATA version 13 (StataCorp.2013. Stata Statistical Software: Release 13, StataCorp LP, College Station, TX). The primary outcome was compliance with the WHO SSC. Analyzed data are presented in tables and text.

Descriptives. Descriptives were summarized using means and standard deviations for the parametric continuous data. Categorical data were summarized using proportions and percentages.

Prevalence of compliance was calculated as follows: the numerator was the number of checked off items on the

checklist. The denominator was the total number of expected checked off items. We expressed compliance as a percentage completion of the items comprising the checklist. There is a total of 19 items in the checklist; therefore, checklist compliance was defined as "noncompliance" (none of the 19 items checked off), "low compliance" (at least 1 to 9 items checked off), and "high compliance" (10–19 items checked off) and was expressed as a percentage of the number of the expected checked off items. We assigned each of the items of the checklist a score of 1, then calculated a percentage of the compliance by dividing the score attained out the 19 which is the expected score. We presented the mean percentage compliances with their corresponding 95% CIs.

Bivariate Analysis. A binary logistic regression model was used to assess for the association of each of the predictors with mortality while a linear regression model was used to asses for the association with the length of hospital stay.

Multivariable Analysis. All factors with a P value of .2 or less at bivariate analysis were simultaneously entered in multivariable linear and logistic regression models, respectively. Confounding was assessed for at a 10% or more difference between the unadjusted and adjusted models. We assessed for confounding after assessing for hospital effects and interaction effects and none were found. Statistical significance was defined as $P < .05$.

We performed linear and logistic regression analysis to determine the association between compliance with the SSC as the main predictor and length of hospital stay, perioperative adverse events, and 30-day mortality, respectively. Results of the linear regression were expressed as coefficient and those of logistic regression expressed as OR with a CI of 95%.

RESULTS

A total of 859 patients were enrolled in the study. Distribution of recruited patients among the different hospitals was fairly similar. Fifty-eight percent of the recruited patients were from Obstetrics and Gynaecology, mostly cesarean sections and were American Society of Anaesthesiologists physical status I and II. The average duration of surgery was 1 hour. Average length of hospital stay was 4 days. Of the total number of recruited patients, 4% (36) died within 30 days of follow-up.

The WHO SSC was initiated in 44% of the enrolled surgeries. Nurses initiated the WHO SSC in 28% of the surgeries and were present more frequently during the performance of the different domains of the WHO SSC. Table 1 shows the different team members present during the different domains of the WHO SSC. Of the recruited participants, 287 (33.9%) were elective surgeries while 559 (66.1%) were emergencies. 33.9% (287) surgeries were performed under general anesthesia while 66.1% (559) were performed under regional anesthesia. Mean overall compliance with the WHO SSC was 41.7% (95% CI, 39.7–43.8) ranging from 11.9% to 89.8% in the different hospitals. Overall compliance with "sign in" was 44% (95% CI, 43–45.6), with "time out" was 42.0% (95% CI, 39.4–44.6), and with "sign out" was 33.3% (95% CI, 30.7–35.9) (Table 2).

There was no statistically significant association between compliance with the WHO SSC and perioperative surgical outcomes: 30-day mortality and length of hospital stay.

Table 1. Team Members Present During the Different Phases of the Checklist

Team Members	Sign In N (%)	Time Out N (%)	Sign Out N (%)	Initiator N (%)
Surgeon	269 (31.3)	263 (30.6)	227 (26.4)	70 (8.2)
Anesthesiologist	146 (17.0)	143 (16.7)	139 (16.2)	25 (2.9)
Medical officer	313 (36.4)	297 (34.6)	293 (34.1)	117 (13.6)
Intern doctor	502 (58.4)	481 (56.0)	427 (49.7)	152 (17.7)
Anaesthetic officer	576 (67.1)	517 (60.2)	466 (54.3)	169 (19.7)
AO student	293 (34.1)	287 (33.4)	213 (24.8)	15 (1.8)
SHO anesthesia	167 (19.4)	161 (18.7)	156 (18.2)	5 (0.6)
SHO surgery	354 (41.2)	339 (39.5)	257 (29.9)	24 (2.8)
Nurse	553 (64.4)	519 (60.4)	487 (56.7)	241 (28.1)
Others[a]	207 (24.1)	176 (20.5)	130 (15.1)	17 (2.0)

N = surgeries for which the members were present during the checklist.
Abbreviations: AO, anesthetic officer; SHO, senior house officer.
[a]Medical students, midwifes, and clinical officer students.

Table 2. Compliance With the WHO SSC

Variables	Overall Compliance Mean (CI)	Compliance Sign In Mean (CI)	Compliance Time Out Mean (CI)	Compliance Sign Out Mean (CI)
Total	41.7 (39.7–43.8)	44.7 (43–46.5)	42 (39.3–44.6)	33.3 (30.7–35.9)
Hospital				
Hospital 1	25.6 (24.5–26.7)	49.3 (46.7–51.9)	15.1 (12.9–17.3)	4.2 (2.7–5.7)
Hospital 2	62.7 (61–64.4)	48.4 (46.6–50.2)	76.3 (72.6–79.9)	61.2 (59.1–63.3)
Hospital 3	11.9 (9.2–14.6)	12.6 (9.7–15.4)	12 (8.9–15.1)	10.3 (7.3–13.2)
Hospital 4	36 (33.2–38.8)	47.4 (45–49.5)	30.8 (27.4–34.3)	13.6 (9.4–17.9)
Hospital 5	89.8 (88.7–91)	75.4 (72.9–78)	97.7 (97–98.6)	98.6 (97.5–99.8)

Overall compliance: average compliance (×/19 checklist items) across all patients.
Abbreviations: CI, confidence interval; SSC, Surgical Safety Checklist; WHO, World Health Organization.

There was a significant association between compliance with the WHO SSC and the incidence of pain and loss of consciousness. We also found that the odds of death were significantly higher compared to the rest in hospital 4 (Tables 3–5).

The WHO SSC was performed in 43.5% of the enrolled surgeries and a copy was present in only 5% of the patient's files of the recruited patients.

In about 80% of the enrolled surgeries, pulse oximeter placement was adhered to during the "sign in" component of the WHO SSC. Ascertaining whether the patient had a known allergy was the worst performed (4.4%). Antibiotic prophylaxis was not given in the recommended time as per WHO standards in about half (49.6%) of the enrolled surgeries. Instrument, needle, and sponge counts were done at "sign out" in less than half (41%) of the enrolled surgeries.

DISCUSSION

We found low levels of compliance across the hospitals with no significant association between this compliance and perioperative surgical outcomes. Mean compliance with the WHO SSC was about 40% with a wide variation across the different participating hospitals and across the African hospitals that found a 48.5% mean use of the WHO SSC with variation between 10% and 90%. Uganda's compliance was 10%.[9] Despite the fact that compliance with the WHO SSC was low, we found no significant association with adverse events, length of hospital stay, and 30-day mortality. This is similar to van Klei et al's[5] study that demonstrated unchanged mortality rates in the patients for whom the checklist was incomplete and significantly lower mortality rates in those patients for whom the SSC was completed in the perioperative period.

The reasons for low compliance with the WHO SSC include lack of leadership, teamwork, and enforcement of the use of the checklist; lack of training and awareness on WHO SSC use, socioeconomic norms, and cultural barriers where hierarchy prevents some team members from initiating the WHO SSC, and resource limitations in terms of stationery, inadequate staffing, and time constraints.[9,10] The variation in compliance is similar to a retrospective study conducted across 28 European countries that found that the average use of the checklist was about 1.5 times higher (65.7%) than that in our study, with a variation of 0%–99.6% among participating hospitals.[11]

Van Schoten's[12] study showed hospital type was one of the factors influencing compliance with the WHO SSC. In our study, we found that the private not for profit hospital had a mean compliance of 60% which we attributed to better funding, leadership, and availability of resources to train and ensure continued use of the SSC. Surprisingly, the regional referral hospital had a compliance of nearly 90% despite the limitations public hospitals have in terms of availability of resources and funding. This remarkably high compliance could be attributed to either the Hawthorne effect or observer bias or both.

Compliance was better with the "sign in" and "time out" phases but worse with the "sign out" phase. From experience, priorities at the end of surgery differ for the different team members. This result is comparable to the findings from van Klei et al's[5] before and after study with a similar case mix. Vogts et al[13] speculated that poor compliance with the "sign out" domain could be explained by the fact that it is not linked to a particular point in the patient's care unlike the other domains of the checklist. Compliance was worse in particular surgical specialties; orthopedic surgery, neurosurgery, and ear, nose, and throat surgery, with compliance to the "sign out" phase of the WHO SSC being the worst done even for these surgical specialties. This is in contrast with van Schoten et al's[12] study where compliance with the

Table 3. Association Between Compliance With WHO SSC and Adverse Events

Variable	Noncompliance (n = 99)	Low Compliance (n = 518)	High Compliance (n = 230)	*P* Value
Bleeding	2 (2.0)	23 (4.4)	16 (7.0)	.163
PONV	4 (4.0)	13 (2.5)	3 (1.3)	.160
Airway obstruction	1 (1.0)	0 (0.0)	2 (0.9)	.243
Prolonged intubation	2 (2.0)	1 (0.2)	6 (2.6)	.324
Hypoxia	1 (1.0)	2 (0.4)	0 (0.0)	.243
Unplanned intubation	0 (0.0)	1 (0.2)	2 (0.9)	.528
LOC[a]	6 (6.1)	1 (0.2)	1 (0.4)	<.001
Altered LOC	2 (2.0)	3 (0.6)	0 (0.0)	.098
Hypotension	3 (3.0)	5 (1.0)	1 (0.4)	.042
Cardiac arrest	1 (1.0)	1 (0.2)	2 (0.9)	.407
Unplanned transfusion	1 (1.0)	3 (0.6)	2 (0.9)	.831
Pain	57 (58.2)	372 (71.8)	209 (90.9)	<.001
ARI	0 (0.0)	1 (0.2)	0 (0.0)	.716
DVT	0 (0.0)	1 (0.0)	0 (0.0)	.716
Peripheral nerve injury	0 (0.0)	14 (2.7)	0 (0.0)	.170
Pneumonia	0 (0.0)	3 (0.6)	2 (0.9)	.414
Pulmonary embolism	0 (0.0)	2 (0.4)	0 (0.0)	.606
Stroke	0 (0.0)	1 (0.2)	0 (0.0)	.716
Sepsis	0 (0.0)	4 (0.8)	4 (1.7)	.301
Septic shock	0 (0.0)	1 (0.2)	0 (0.0)	.716
Graft failure	0 (0.0)	3 (0.6)	0 (0.0)	.528

Column percentages have been reported in parentheses.

Abbreviations: ARI, acute renal injury; DVT, deep venous thrombosis; LOC, level of consciousness; PONV, postoperative nausea and vomiting; SSC, Surgical Safety Checklist; WHO, World Health Organization.

[a]LOC >24 h.

Table 4. Logistic Regression Showing Association Between Compliance With WHO SSC and 30-d Mortality

		Bivariate Analysis		Multivariate Analysis	
Variable	N (%)	OR (CI)	*P* Value	OR (CI)	*P* Value
Surgical specialty[a]					
General surgery	162 (18.9)	1	…	1	…
Pediatric surgery	60 (7)	0.2 (0.0–1.7)	.140	…	…
Obstetrics and gynecology	494 (57.6)	0.3 (0.2–0.8)	.008	0.5 (0.2–1.5)	.251
Ear, nose, and throat	25 (2.9)	3.1 (1–10)	.051	3.5 (0.8–14.7)	.050
Orthopedic surgery	58 (6.8)	0.4 (0.1–2.1)	.301	0.5 (0.1–3.1)	.478
Neurosurgery	25 (2.9)	1.1 (0.2–5.7)	.920	…	…
Urgency[a]					
Elective	381 (44.4)	1	…	1	…
Emergency	477 (55.6)	0.8 (0.4–1.5)	.470	0.9 (0.4–1.8)	.692
Type of anesthesia[a]					
General	287 (33.9)	1	…	1	…
Local	559 (65.1)	0.5 (0.3–1)	.038	0.7 (0.3–1.7)	.461
Comorbidities[a]					
Hypertension	29 (3.4)	0.6 (0.1–2.5)	.470	…	…
Asthma	10 (1.2)	0.4 (0.05–3.1)	.380	…	…
Other morbidities	78 (9.1)	0.8 (0.3–2.3)	.670	…	…
ASA physical status[a]					
I	387 (45.1)	1	…	1	…
II	366 (42.7)	0.7 (0.3–1.7)	.487	0.7 (0.2–1.8)	.412
III	68 (7.9)	3.5 (1.5–8.8)	.006	4.6 (0.9–25)	.170
IV	9 (1.1)	13.3 (3–58.7)	.001	3 (0.4–24.7)	.340
Duration of surgery (min)	61.2 ± 56.5	1	.380	1 (1)	.483
Hospitals					
1	215 (25)	1	…	…	…
2	151 (17.6)	0.5 (0.05–4.6)	.520	0.6 (0.0–12.5)	.752
3	199 (23.2)	3 (0.8–11.3)	.110	4.6 (0.9–25)	.081
4	148 (17.2)	12.3 (3.6–42.1)	.000	23.5 (4.8–115.7)	<.001
5	146 (17)	1 (0.2–6)	.990	4.1 (0.2–74.9)	.344
Compliance					
Noncompliance	99 (11.7)	1	…	…	…
Low compliance	518 (61.2)	0.9 (0.3–2.5)	.857	0.6 (0.1–3.2)	.592
High compliance	230 (27.1)	0.2 (0.1–1.1)	.061	0.5 (0.1–6.4)	.588

Abbreviations: ASA, American Society of Anesthesiologists; CI, confidence interval; OR, odds ratio; SSC, Surgical Safety Checklist; WHO, World Health Organization.
[a]Variables with missing data.

WHO SSC was high in ENT surgery. The reason for our results remains unclear.

Previous studies have proposed direct and indirect mechanisms by which the checklist improves surgical outcomes. An indirect mechanism would be improved teamwork and communication among the entire surgical team which will likely improve safety in the perioperative period.[14] Timely administration of the correct antibiotic would be a direct mechanism. Although we did not study quality of checklist performance, we found that nurses were present more frequently during the performance of the SSC compared to other team members, indicating a lack of teamwork during the use of the SSC.

Unlike in previous studies,[15] we found no significant association with either 30-day mortality or length of stay. Because this was a secondary objective, our study was not powered to detect the association between compliance and the aforementioned outcomes due to resource constraints. These results should therefore be interpreted with caution. Possible explanations could be low American Society of Anaesthesiologists physical status, lower risk surgical procedure as the majority were cesarean sections and use of regional anesthesia, all of which reduce the risk of perioperative adverse events.[16,17] There was, however, a statistically significant association between compliance and some perioperative adverse events as defined by the American College of Surgeons National Surgical Quality Improvement Program[18] particularly pain and loss of consciousness. The reason for the association of better compliance with the presence of pain and loss of consciousness postoperatively remains unclear. The reason for the increased odds of death at hospital 4 remains uncertain and warrants investigation.

Strengths of this study include the fact that a prospective multicentre cohort study reduces the risk of recall bias and improves the generalizability of the results. As one of the larger studies of its kind in sub-Saharan Africa, it adds valuable information to the pool of data on the WHO SSC. Our main limitation was the small sample size compared to similar studies that may have prevented recognition of some adverse events that occur less frequently. A sample size of about 3500 patients would have been sufficient to achieve this objective. The Hawthorne effect cannot be ruled out in a directly observed study such as ours. We did try, however, to reduce its effect by ensuring that the investigators were familiar to the surgical team and trained them to document their observations in a manner that would not raise suspicion although in doing this, we could have increased the risk of observer bias. We were unable to collect data on age and sex of the study participants, an oversight on our part and this limited our analysis.

Table 5. Linear Regression Showing the Association Between Compliance With WHO SSC and Length of Hospital Stay

Variable	N (%) or Mean ± SD	Bivariate Analysis		Multivariate Analysis	
		Coefficients	*P* Value	Coefficients	*P* Value
Surgical specialty[a]					
General surgery	162 (18.9)	1	…	1	…
Pediatric surgery	60 (7)	−0.9 (0.5)	.108	−0.5 (0.5)	.332
Obstetrics and gynecology	494 (57.6)	−1.8 (0.3)	.000	−1.4 (0.3)	.000
Ear, nose, and throat	25 (2.9)	−2.1 (0.8)	.010	−1.1 (0.8)	.171
Orthopedic surgery	58 (6.8)	1.4 (0.5)	.010	2.2 (0.6)	.000
Neurosurgery	25 (2.9)	−0.1 (0.8)	.857	−0.2 (0.8)	.782
Others	33 (3.9)	−1.6 (0.7)	.018	−2 (0.7)	.754
Urgency[a]					
Elective	381 (44.4)	1	…	1	…
Emergency	477 (55.6)	−0.0 (0.2)	.906	0.4 (0.3)	.070
Type of anesthesia[a]					
General	287 (33.9)	1	…	1	…
Local	559 (65.1)	0.1 (0.1)	.687	0.2 (0.1)	.131
Comorbidities[a]					
Hypertension	29 (3.4)	−1.9 (07)	.005	0.6 (0.7)	.469
Asthma	10 (1.2)	0.1 (1.1)	.943	0.4 (1.1)	.383
Other morbidities	78 (9.1)	…	…	0.8 (0.5)	.672
ASA physical status[a]					
I	387 (45.1)	1	…	1	…
II	366 (42.7)	−0.6 (0.3)	.022	0.2 (0.3)	.532
III	68 (7.9)	1.8 (0.5)	.000	1.7 (0.5)	.001
IV	9 (1.1)	2.4 (1.4)	.095	2.3 (1.4)	.110
V		4.8 (2.5)	.057	3.4 (2.4)	.161
Duration of surgery (min)	61.2 ± 56.5			0.0 (0.0)	.004
Hospitals					
1	215 (25)	1	…	1	…
2	151 (17.6)	1.5 (0.4)	.000	1.9 (0.5)	.001
3	199 (23.2)	0.4 (0.4)	.267	0.4 (0.4)	.304
4	148 (17.2)	1.4 (0.4)	.000	1.8 (0.4)	.000
5	146 (17)	1.5 (0.4)	.000	1.9 (0.7)	.010
Compliance					
Noncompliance	99 (11.7)	1	…	1	…
Low compliance	518 (61.2)	0.6 (0.4)	.161	0.7 (0.5)	.154
High compliance	230 (27.1)	1.4 (0.4)	.001	0.6 (0.7)	.319

Abbreviations: ASA, American Society of Anesthesiologists; SD, standard deviation; SSC, Surgical Safety Checklist; WHO, World Health Organization.
[a]Variables with missing data.

CONCLUSIONS

We set out to find the extent of compliance with the WHO SSC and the association of this compliance with perioperative surgical outcomes. We found that compliance with its use in Uganda's referral hospitals showed an association with the increased incidence of pain and loss of consciousness postoperatively. Following these results, we recommend that a larger study, well powered to detect an association of compliance with perioperative adverse events, is done to demonstrate generalizability of the results. We also recommend that further research associating pain scores with use of the WHO SSC be considered.

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DISCLOSURES

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