ORIGINAL RESEARCH

A review of evolution, implementation, impact and improvisation of who surgical safety checklist - the panacea for safe surgical practice

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Received: 16 December, 2022 Accepted: 20 January, 2023

ABSTRACT

Adverse events during surgery have major consequences not only on the patients but also on the healthcare system. With around 310 million surgeries happening globally and increasing complexities in surgery, mishaps during surgery have contributed to a major proportion of preventable errors. The World Health Organization (WHO) introduced the WHO Surgical Safety Checklist (WHO SSC), as a tool to reduce harm in surgical patients, in 2008. The checklist has had global acceptance, evidenced by mandatory implementation across the globe by regulatory authorities. This literature review is intended to understand the evolution of the WHO SSC, the pattern of implementation, impact of the WHO SSC on global healthcare and the improvisation of existing checklist strategy. The use of the WHO SSC across the global healthcare facilities is widespread and the operating room staff perceive the checklist as having a huge positive impact on patient safety and work efficiency.

INTRODUCTION

The operating room is a complex interdependent environment, wherein multidisciplinary teams work in unison to bring out optimal surgical outcomes. With the incidences of cancers, trauma and novel organ transplant procedures increasing, surgical care has become an integral part of global public health. Globally, around 310 million major surgeries are performed each year (Dobson, 2020). Even though surgical procedures are intended to save lives, inappropriate surgical care can lead to substantial injury to patients and their families (WHO, 2008). Adverse events or patient injuries resulting from surgical care are more frequently related to errors occurring before or after the surgical procedure, rather than by the actual operative technique and include a breakdown in communication, failure to diagnose, treatment delays, and medication errors (Kim, et al., 2015). The incidence of adverse events during hospital admission is approximately 9% of all admitted patients and almost half of it is surgery-related (de Vries, et al., 2008). Around half of the surgery-related adverse events are considered to be preventable (WHO, 2008). Recognizing the impact of safety issues in

surgical care, the World Health Organization(WHO) addressed the problem by adopting 'Safe Surgery Saves lives' as the second global Patient safety challenge in 2008 and developed the WHO Surgical Safety Checklist (SSC) to help surgical teams across the globe to reduce the occurrence of harm to surgical patients. The WHO Surgical Safety Checklist is pillared on facilitating communication and teamwork, while being structured in a way to ensure that simple tasks were completed in an appropriate sequence, regardless of financial or resource limitations (Weiser &Waynes, 2018). The checklist is a cheap patient safety instrument and was devised to improve adherence to evidence-based safety practices (Urban, et al., 2021). The original WHO SSC is a 19-item checklist administered in three parts;

a. Before induction of anesthesia (Sign-in)
b. Before skin incision (Time-out) and
c. Before the patient leaves the operating room (Sign-out).

'Sign-in' is the first section that includes verifying the patient's identity, the operative procedure, the correct site, and patient consent before the anesthesia induction. 'Time-out' includes repeat confirmation of the correct surgery, site, and patient before the skin incision, along with a discussion of anticipated critical events, prophylactic antibiotics, availability of the equipment, and critical radiological reports. 'Sign-out' is the last section that includes the record of the surgery done, instrument count, and identification of the correct specimen before the patient leaves the operating room. Initial pilot testing of the checklist following its introduction in 2008 by the WHO resulted in a dramatic 47% decrease in mortality and a 36% fall in complications (Weiser &Waynes, 2018). This led to the checklist being adopted rapidly by healthcare facilities across the world and has become a standard of care in many health systems. The WHO SSC has become an integral part of accreditation standards led by the Joint Commission International (JCIA), Accreditation Canada, and various regional accreditation agencies and regulatory authorities. JCIA has identified ensuring 'safe surgery' as one of the six International Patient Safety Goals (IPSGs). The WHO SSC holds a positive review among most healthcare staff involved in the provision of care to surgical patients, with nearly 85% of operating room staff perceiving it as an added value to ensure patient safety (Tan, et al., 2021) and a greater proportion claiming that they would prefer the use of a patient safety checklist for their surgical care. The SSC was found to impart a huge positive impact on team communication and teamwork. Engaging patients in the surgical safety checklist was also considered to be beneficial in providing safe care (Urban, et al., 2021). Overall, a positive view of the WHO SSC led to the worldwide acceptance of the checklist into routine surgical practice. The WHO Surgical Safety Checklist has also encountered a multitude of challenges and has faced shortfalls in correct and consistent implementation. Operating rooms include different surgical departments with their own unique work cultures and clinical practice style. Many healthcare facilities demonstrate wide gaps in WHO Surgical Safety Checklist implementation, with documented data differing grossly from what is practised (Brown, et al., 2021). Most of the quality data are based on an audit of clinical documents and hence the exact assessment of the impact of the surgical safety implementation effectiveness could be really difficult to assess. Despite the heightened awareness regarding the checklist, implementation adherence and degree of completeness have not been consistent uniformly due to numerous barriers that include, lack of motivation, deficient knowledge of correct use, lack of motivation and enthusiasm from team members, hierarchical barriers, and inappropriate implementation protocols (Gong, et al., 2021). Completeness of the WHO Surgical Safety Checklist, in any healthcare facility, varies proportionately to the extent of policing of operating room checklist behaviour, and compliance is always observed to be sub-optimal, even though the checklist items are marked completely (Tan, et al., 2021). Perception by the surgical team, of the usefulness of the SSC, also varies according to the professional category, with nurses being highly critical regarding

compliance compared to other professional staff in the operating rooms (Domingo, et al., 2022). According to Domingo et al., (2022), junior staff in the operating room had more awareness regarding the usefulness of the SSC compared to senior leaders and surgical staff. Checklists have been responsible for a few of the most remarkable successes of the patient safety era, especially in improving the perioperative safety of patients undergoing surgical procedures. Good quality evidence exists to confirm the benefits of the use of surgical safety checklists and improvement in outcomes. Despite the positive impact of the surgical safety checklist since its rollout by WHO in 2008, a few studies have raised concerns regarding the structure, implementation, compliance, and perception of the checklist by the healthcare staff involved in surgical care. A wide discrepancy between surgical safety checklist documentation and actual practice has been highlighted to exist even in the developed world (Brown, et al., 2021). The purpose of the literature review was to identify the impact of WHO SSC on patient safety, compliance with the checklist, and perception of the checklist by operating room staff. Secondarily, the current level of implementation of the checklist along with the barriers and enablers of effective implementation were reviewed to identify the gaps in achieving effective outcomes from the use of WHO SSC. The review of literature pertinent to the WHO SSC could be divided into three major domains

1. Impact of the SSC on clinical practice
2. Implementation of the checklist
3. Improvisation of the checklist

DISCUSSION

IMPACT OF THE WHO SSC ON CLINICAL PRACTICE

The WHO SSC was conceptualized to ensure the safety of patients undergoing surgery worldwide. The 19-point checklist was proposed to reduce the rate of major surgical complications. Haynes et al. (2009) conducted a prospective study of the implementation of a two-step checklist on perioperative morbidity and mortality. Their study spanned eight major hospitals in eight major cities across the world and concluded that there was a significant reduction in both morbidities as well as mortality following the implementation of the surgical safety checklist. They also stated that even though there was a significant reduction in morbidity in both high and low-income facilities, the reduction in morbidity post-intervention in low-income facilities was not clinically significant. Although the study was one of the earliest to demonstrate a positive impact of the WHO SSC on reducing surgical complications, the choice of healthcare facilities chosen was based on geographic locations under the World Health Organization, which could have influenced the results since the surgical culture differs between the developed and developing countries. Also, the study was limited to inpatients alone with outpatient surgical procedures not included and hence the results cannot be applied to the general population. Gong et al. (2021a) studied the frontline healthcare staff's perception of various aspects of the WHO SSC using a survey tool and inferred that a majority of participants endorsed the view that the implementation of a checklist prevented major errors in the operating room, such as wrong patient, wrong site of surgery and wrong procedure. The study highlighted the fact that even though the operating room staff was aware of the importance of WHO SSC, a vast majority of the respondents suggested shortening the SSC procedure to increase compliance, and also surgeons were averse to the use of WHO SSC especially during emergency surgeries. The responses from surgeons were in favour of the WHO SSC being a waste of time. Sendlhofer et al. (2016) performed a follow-up on an initial study of compliance with the surgical safety checklist and concluded that the individual perception and usefulness of the SSC were found to be high and increased from their previous study. A majority of their respondents opined that the SSC was familiar, important, and good for surgical patients, while at the same time, the comfort of use

was rated lower by all professional categories involved in surgical care. They concluded that individual perception of the usefulness of the SSC does not have a direct bearing on the actual application and compliance, with improving acceptance of the SSC proving to be a growing challenge. (Sendlhofer, et al., 2016). Tan et al. (2021) conducted a prospective cross-sectional study to study the influence of the WHO SSC at five level 3 hospitals in China. Around 90% of responders agreed that the WHO SSC improved operating room safety and helped to avoid errors in the operating room. More than 96% of the responders indicated that they would prefer the checklist to be used if they undergo any surgery. Improved communication was a major consequence of the implementation of the checklist, with 85% of responders accepting that the checklist improved team communication. One major finding from the study was that more than half of the responders suggested increased patient anxiety due to the use of a checklist, given repeated verification of identification and surgery details. Haugen et al. (2019) brought out a review on the impact of the WHO SSC on patient safety. They elaborated on the origin, implementation, and possible clinical impact of WHO SSC using the Donabedian (structure-process-outcome) framework. In addition, they stressed the fact that the introduction of any checklist would be as effective as its implementation, and a strategic, committed approach rather than a naïve implementation approach would lead to the success of the checklist and improve outcomes. Papaconstantinou et al. (2013a) in their study on the impact of surgical safety checklists on team perspectives, inferred that nearly 90% of responders did not disagree with the fact that patient safety and care were improved by the checklist. One important finding observed in their study was that nearly 35% of responders, especially the anesthesia personnel opined that they were not in agreement that the checklist improved operational efficiency. This was one of the studies raising concern about the negative impact of the checklist on work efficiency, while a majority of studies have shown a positive impact of the WHO SSC, despite the checklist not being a time-consuming process. Sotto et al. (2021) performed a systematic analysis and meta-meta-analysis of the findings in WHO SSC systematic reviews. The study concentrated on four main themes namely clinical outcomes, process measures, team dynamics, and communication. They concluded that a vast majority of the findings correlate with a positive impact of the surgical safety checklist on the four major themes. Interestingly, the study brought out another domain, namely efficiency, and workload where the direction of the flow was negative, implying that the users felt the surgical checklist slowed down processes within the operating room. One justification for the negative impact on efficiency provided by the authors is that WHO SSC is purposefully designed to slow the processes in the operating room – the process of 'time-out' needing to set aside other tasks to focus attention on patient safety concerns. They also concluded that the use of surgical safety checklists was widespread across countries with both high and low development indices and that there is ample room for improvement in implementation and modifying the checklist to suit the local work culture. Wangoo et al. (2016) in their systematic review identified that different professional categories place differing importance on SSC adherence and checklist completion might create a rift between the team members and widen pre-existing power differentials. Most of the literature reviewed was optimistic about the positive impact of the checklist in improving patient safety and team communication while having a mixed review of its role in improving work efficiency and team dynamics. Widely varied clinical practice patterns, differing levels of income, stringent regulations, and workplace culture are major factors that could contribute to the mixed outcomes.

IMPLEMENTATION OF THE CHECKLIST

The WHO SSC has been accepted globally since its introduction by WHO as a tool for reducing perioperative morbidity and adverse events. Despite the increased awareness about

the checklist, the implementation compliance has been reported to be inconsistent and the degree of completeness varied widely (Gong, et al., 2021). Sendlhofer et al. (2016) in their study on individual perception and compliance inferred that more than 99% of responders used the SSC in their practice and around 89% responders specified of using the SSC in nearly 91-100% of all operations. There were no significant differences between the surgeons, anesthesiologists, nurse anesthetists, or operating room nurses regarding the use of the SSC in daily practice. They observed that there were multiple barriers to ensuring complete compliance and that could be decimated by an engaged leadership and a checklist that fits into their routine work pattern. They also inferred that even though there was a high perception of the usefulness, and increased subjective and objective knowledge of the SSC, compliance was a major issue, which did not differ among the various professional categories. Gillespie and Marshall (2015) conducted literature research on the acceptance and compliance of the WHO SSC dating from 2008, the year it was introduced by WHO. They summarized their findings that WHO SSC achieves maximum success if the medical staff participates actively in the implementation process and the active involvement of clinicians in tailoring the SSC to their context enabled greater participation and ownership. Tailoring the checklist to address barriers and adapting it to the local requirements was a crucial factor in improving compliance and acceptance. They suggest that the SSC should be implanted in alignment with its goal of achieving improvement in work processes through better communication, which requires flexibility in the process. Tan et al. (2021) in their prospective cross-sectional study inferred that the average total compliance – all items filled was around 78%. Interestingly, sign-in compliance was very high at nearly 95%, compared to time-out (70%) and sign-out (78%). Wangoo et al. (2016) performed a systematic review of the surgical safety checklists and inferred that the SSC initiation rates were quite high across a majority of the studies, with a wide variance in the observed compliance (2%-99%). They also observed that sign-out was the most neglected part of the checklist and an extensive difference of more than 30% between checklist completion and observed completion rates. A major finding in their review was that although the checklist was well received by the operating room staff, a lack of rigour in its application was very obvious, leading to a sense of false security and chances of compromised safety. They concluded that the literature supports the fact that nurses perceive maximum benefit from the implementation of SSC, while the surgeons perceive the least, with anesthetists falling in between. Urban et al. (2021) conducted an observational study on surgical safety culture across developed countries. They included multiple perspectives on the use of WHO SSC like safety culture, the impact of the checklist, training, and team dynamics, and concluded that around half of the respondents opined that they had received adequate training in the use of WHO SSC and there was a statistically significant difference in the number of respondents with fewer years of experience(<10 years) complaining of inadequate training for the use of the checklist, compared to healthcare professionals with more experience(>20 years). Significantly, nurses had a positive opinion about the training received compared to the surgeons and anesthesiologists. There were also significant differences in training satisfaction between countries and also between the type of healthcare facilities (Ambulatory Vs Tertiary hospitals). Gul et al. (2022) performed a clinical audit on surgical safety compliance in a huge tertiary hospital in a developing country in a two-step survey, before and after the implementation of an educational program and also tried to identify the major barriers to the implementation of the WHO SSC. They observed a nearly 25% improvement in compliance with sign-in and time-out, while sign-out compliance doubled after the educational intervention. Nearly all the respondents opined that staff awareness and training were inadequate to comply with the surgical checklist and nearly 81% of the responders expressed a general lack of interest in the initiation of the checklist by the team. One of their

observations includes that the mutual introduction of team members during a time-out had the least compliance. They summarized the barriers to the implementation of the surgical safety checklist and cited repetition of facts, time-consuming, cause delay, interrupts work-flow, absent team members, lack of awareness, and incentivization as the major hurdles in implementing the checklist. Sendlhofer et al. (2015) studied the compliance and satisfaction following the implementation of a surgical safety checklist and concluded that overall satisfaction regarding the use of the checklist was high regardless of the professional category, but there was a significant difference among surgeons and anesthesiologists among the doctor group. (Gong, et al., 2021b) carried out a quantitative study on the attitudes and barriers to the surgical checklist among gynecological surgery teams and observed that satisfaction with overall compliance with the surgical safety checklist was high among surgeons, anesthesiologists, and nurses, but there was a significant difference between the gynecologists and other professional categories in that a higher percentage of the surgeons expressed satisfaction with the implementation of the checklist. They identified lack of time due to the higher number of surgeries, absence of surgical team members, and length of the safety checklist as the major deterrents for the implementation of the checklist. They suggested reducing the workload of surgical team members, emphasizing the importance of checklist steps and training as ways to improve compliance with implementation. Weiser & Haynes (2018), had discussed the role of the surgical safety checklist ten years after its introduction and opined that to improve implementation, a thorough and thoughtful approach with consideration of the local culture would be highly beneficial. A focus on fostering team dynamics through meaningful implementation is the key to achieving a meaningful outcome from the checklist as per the authors. Mandatory use as stipulated by regulatory authorities has not achieved much success in improving surgical outcomes unless supplemented by a strategic and systematic plan, supported by strengthening processes and communication. High compliance rates have been documented by the various studies, but the ownership of the checklist process has been ambiguous, with no clarity on taking the onus of any of the professional categories in a surgical team. Despite the WHO SSC being mandated compulsorily in many countries, there have been deficiencies in compliance and implementation.

IMPROVISATION OF THE CHECKLIST

The WHO SSC has strong evidence to support its contribution to improving perioperative safety, but its impact is directly related to the effectiveness of its implementation (Bashford, et al., 2014). Implementation of the checklist should necessarily be followed up with periodic assessments to identify problems and address deficiencies (WHO, 2008). The WHO SSC from the time of introduction has advocated adopting and customizing the checklist, to suit the local culture and regulations, to maximize the outcome of the use of a checklist. Globally, the team member mostly identified as leading the checklist process is the circulating nurses. Urban et al. (2021) in their study on the surgical team's attitudes toward surgical safety, observed that nearly three-quarters of the respondents felt the surgeon should be leading the checklist process. Their results also show that, when asked to identify the leader of a checklist in their team, the responders self-attributed a greater leadership role to their profession, attributing to the ambiguity in leading such a critical process. The authors also suggest the need for clarity in defining the leadership role during the implementation, to improve communication and benefit the outcome. Ownership contributes greatly to the success of any checklist. Leadership and teamwork working in cohesion lead to the success of any process. Patient engagement in the checklist process found support from nearly 80% of the respondents, especially nurses. Tan et al. (2021) in their observational study on attitudes and compliance with the WHO SSC, observed that the nurse-led checklist process

had poorer compliance compared to the anesthetist-led process. This observation contradicts many other observational studies and could be attributed to the restricted job profile and work culture of nurses in the country of study. Brown et al. (2021), in their observational audit, performed a baseline audit on the surgical safety checklist and demonstrated a compliance of only 3.5%, despite documented evidence of 100%. The authors reinforce the need for consistency during the initial phases of rollout, the presence of the quality team, and staff involvement as major measures to improve engagement and improved compliance. Post-intervention in the form of checklist modification and extensive staff-wide education programs, the compliance was demonstrated to rise to nearly 63%. Wangoo et al. (2016) observed that most hospitals delegate the responsibility of initiating the checklist process to the operating room nurses, while other surgical team members too need to understand the value of diligent completion of the checklist and support nurses in the checklist process. Hence, it is essential to involve every staff in the implementation process, to annihilate inherent inter-disciplinary differences in the attitude of team members toward the surgical safety checklist. Russ et al. (2014), performed a study to understand patients' views of the surgical safety checklist. Postoperative patients were chosen as subjects and shown professionally produced videos demonstrating the safety checklist process. Nearly 80% of the respondents supported the use of a checklist during the surgical procedure. A majority of the respondents were of the view that the checklist would make them feel safer, would improve effective communication between the surgical team, and reduce the number of mishaps. However, most of the patients opined that they did not feel that they had a major part to play in the safety improvement process and it was appropriate to leave decisions regarding patient safety to the healthcare professionals. Harris et al. (2020) conducted a qualitative study to assess the recommendations of patients and healthcare workers for a surgical patient safety checklist. Their study highlighted the significance of surgical safety checklists in reducing surgical adverse events as felt by both the patients as well as healthcare workers. They observed that a majority of the study patients expressed their desire to be an active part of the patient safety process and desired to use a checklist before surgery. The authors concluded by recommending a surgical patient checklist to improve patient involvement in the surgical safety process. Munthali et al. (2022), studied the barriers and enablers to the utilization of the WHO SSC. They inferred that the initial barrier to the implementation of the surgical safety checklist is related to a lack of adequate training. The mere introduction of a checklist into the system alone does not guarantee improved outcomes unless healthcare staff undergoes extensive education and sustainable training. WHO had kept the SSC relatively open, advocating necessary modifications to adapt to the local conditions and relevant practice patterns. Overall opinion from the literature points towards improvisation being a necessity to improve outcomes from a checklist, while the involvement of patients in the safety checklist needs more research and data to be taken up for active implementation.

CONCLUSION

The WHO SSC has evolved from being a simple tool for safe surgical practice to a standard of care. A widespread acceptance and compliance prove its worthiness in avoiding medical errors and ensure safety for patients undergoing surgeries. Over the years, the checklist has proven its utility in improving teamwork and communication, but the implementation of checklist has faced multiple challenges, especially in those countries where 'culture of safety' is yet to be imbibed. Adopting the checklist to involve local practices and bringing in patient involvement in surgical safety would go a long way in improving the efficiency of the checklist, resulting in positive outcomes. Education and training are crucial to ensure the continued success of the checklist.

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