

EVALUATION OF COMPLIANCE WITH OXYGEN CYLINDER SAFETY PROTOCOLS AMONG HEALTHCARE PROVIDERS IN TERTIARY CARE HOSPITAL OF PESHAWAR

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Abstract

Background:

Patient safety is a fundamental component of safe anesthesia practice. The World Health Organization (WHO), in collaboration with the World Federation of Societies of Anaesthesiologists (WFSA), has developed international standards and safety recommendations to promote safe anesthesia care. This study aimed to assess anesthesia providers' current practices, evaluate their knowledge and understanding of critical patient safety standards, and identify potential gaps between their knowledge and clinical practice, particularly regarding the use of the WHO Surgical Safety Checklist.

Methods:

A descriptive cross-sectional study was conducted among anesthesia-related healthcare professionals working in the Operation Theatre (OT) and Intensive Care Unit (ICU) at Hayatabad medical complex. Data were collected from **90 participants** using a structured questionnaire designed to assess their knowledge, awareness, and practices related to anesthesia patient safety standards and the WHO safety checklist. The collected data were analyzed using descriptive statistics.

Results:

A total of 90 participants were included in the study. Among them, 77 (85.6%) were males and 13 (14.4%) were females. Regarding professional designation, 13 (14.4%) were anesthesia technicians, 36 (40.0%) were anesthesia technologists, 25 (27.8%) were anesthesiologists, and 16 (17.8%) were anesthesia trainees. The findings showed that 65 participants (72.2%) were familiar with the

WHO safety checklist, whereas 25 participants (27.8%) were not familiar with it. These findings indicate that although the majority of participants were aware of the WHO safety checklist, a considerable proportion lacked familiarity with this important patient-safety tool.

Conclusion:

The findings suggest that the WHO Surgical Safety Checklist is recognized as an important tool for promoting patient safety among HEALTH CARE PROVIDERS staff at HMC. Its appropriate and consistent implementation may contribute to improved communication and teamwork, reduction of preventable anesthesia-related errors, and enhancement of overall patient safety. However, the identified gap in familiarity among some participants highlights the need for continued education, training, and monitoring to ensure effective implementation of anesthesia safety standards.

1. INTRODUCTION

Anesthesia, which is a controlled, brief loss of feeling or consciousness, is induced for veterinary or medicinal objectives. There may be partial or total unconsciousness, paralysis (muscle relaxation), amnesia (memory loss), and analgesia (pain reduction or prevention). Anaesthetized refers to a person who is under the influence of anesthesia. To develop the International Standards for a Safe Practice of anesthesia, the World Health Organization (WHO) collaborated with the World Federation of Societies of Anesthesiologists (WFSA), a nonprofit organization that represents anesthesiologists in 150 countries (1).

For healthcare administrators, physicians, patients, and their families, the idea of patient safety is particularly valuable since it promotes improved care delivery and reduces costs(2)

The main goal of a medical facility is to prevent and reduce damage to patients while they are being treated (3). Checklists are being used more frequently by anesthesia teams throughout the perioperative period to improve clinical care and patient safety (4).

They are putting forth the concept of patient-centered intra-anesthesia care teams to greatly enhance anesthesia safety both within and outside of operating rooms (2). The anesthesiologist's years of experience and professional status were found to influence patient safety knowledge and practice, which seems to be low among Enugu, Nigeria's medical professionals (5). The WHO checklist improves "patient safety and inter-discipline communication" and highlights current safety

procedures to avoid "possible complications"(6).

The anesthesiologist or individual being assessed for anesthesia fitness filled out a pre-made survey (7). But factors including staff instability, a general distaste for the checklist, a lack of teamwork, and a refusal to complete the checklist made its adoption difficult. Due to the absence of a crucial OR team member who was either out of the operating room or distracted by other issues, the TSO (team sign out) was not implemented (6).

One of the core principles of anesthesia care worldwide is patient safety. The field of anesthesiology has led medical research on patient safety, care standard implementation, and gradual improvement of care processes for the past 50 years.

All of these efforts have resulted in significantly reduced anesthesia hazards for patients. However, not all countries have been successful in enhancing patient safety in relation to anesthesia. The views of national anesthesia society leaders in thirteen different nations are presented in this article(8).

The study was conducted between March 2021 and February 2022 using an online questionnaire. The survey link was released by Ukrainian Anesthesiologists Association (UAA) members. To sum up, 210 persons answered the poll. Only 40.3% of respondents stated that their medical institutions have complied with the Declaration's recommendations, despite 79.1% of respondents stating they were aware of the Helsinki Statement on Patient Safety in Anesthesiology. Although most respondents

stated that the Helsinki Declaration's implementation had improved the quality of the work, 16% claimed there was no positive effect (9).

In order to increase patient safety and lower complications, the World Health Organization's (WHO) surgical safety checklist focusses on process organization, communication, and teamwork in clinical practice. This study aimed to characterize the experiences of registered nurse anesthetists (RNA) with the WHO surgical safety checklist. Nurse anesthetists can deliver perioperative and anesthetic care more easily thanks to the WHO checklist. It helps them better comprehend the individual issues of each patient and makes the nurse anesthetist feel more like a part of the team (10).

As a specialty, anesthesiology has a long history of technological innovation associated with increased patient safety. Nonetheless, the past 20 years have seen an unparalleled rate of technical advancement. Artificial intelligence (AI) tools are being used in the perioperative setting, mostly due to the exponential development of data and computing capacity. Current developments in perioperative medicine and anesthesiology hold great promise for further enhancing patient safety and care quality (11).

The surgical burden is more than it was previously due to the rise in non-communicable diseases, trauma, and caesarean deliveries. This makes increasing patient safety during surgery and anesthesia a significant worldwide public health concern. The surgical burden was recognized by the World Health Assembly in 2015, and as part of universal health coverage, access to emergency and essential surgical and anesthesia treatment was expanded for the first time. The main cause of the variations in anesthesia safety between countries is economic standing. In wealthier nations, it is extremely secure, but it lags far behind in other parts of the world. A study conducted in Ethiopia by Bashford found that many participants were unable to administer safe obstetric (89%), spinal (50%), pediatric (63%), and general (39%).

Following the World Health Organization's (WHO) 2009 Guidelines for Safe Surgery,

checklists are now a standard part of surgical care. They have been associated with improved safety compliance, improved collaboration and communication, reduced complications and mortality, and economic benefits. The WHO Guidelines for Safe Surgery further advise that before beginning any procedure, the patient's anesthetic risk, medications, breathing circuit, and anesthetic equipment should be formally inspected (12). The WHO surgical safety checklist only contained a few really crucial anesthesia-related elements (such checks of the saturation sensor, but not blood pressure monitoring or an ECG), so a separate anesthesia preinduction checklist (APIC) was introduced in addition to the WHO surgical safety checklist.

The World Health Organization promotes patient safety best practices during surgical procedures through its Safe Surgery Saves Life program. The best practices for patient safety are inextricably linked to anesthesia services. The availability of skilled anesthesiologists, their knowledge, the workplace, the availability of required equipment, and monitoring facilities all contribute significantly to patient safety and the safe provision of anesthesia services, even though these services are safer than ever. Although anesthesiologists offer middle-tier perioperative care, their contributions are often overlooked, especially in low- and middle-income countries (LMICs) (13).

The idea of patient safety is crucial to management, healthcare providers, patients, and their families because it promotes more effective care and reduces expenses. Examining the field of anesthesiology reveals changes in epidemiology, the complexity and quantity of procedures that have expanded, and the adoption of a new matrix of important abilities that are necessary for Brazilian anesthesiology residents. Therefore, it is essential to determine the current level of patient safety competency among residents in anesthesiology. Given the significance of the issue, the World Health Organization (WHO) has prioritized two initiatives: a global hand cleanliness campaign to reduce the dangers that damage patients and the promotion of safer surgery.

It is common to compare using crisis checklists in anesthesia to operating an aero plane and giving anesthesia. Instead of using checklists in crises, which by definition don't occur very often in real life, the notion for using them in the cockpit stems from their regular use throughout flight management.

Commercial airline and private pilots usually complete several checklists to check the condition of their aircraft during each flight cycle¹⁶: before pushing back from the gate, when the engines are started, during taxiing, during takeoff, after takeoff, at the top of the climb, before descent, during approach and before landing. Every flight concludes at the gate with a shutdown checklist (14).

"Patient safety" was first used in the groundbreaking work of the Anesthesia Patient Safety Foundation (APSF) in 1985. Patient safety is a crucial aspect of high-quality care and can be defined as the lack of adverse outcomes from medical procedures that could result in death, prolonged hospitalization, or permanent injury.

In addition to resulting in long hospital stays and chronic incapacity for victims, adverse healthcare events caused by medical errors are well documented; according to recent estimates, they contribute to 200,000 fatalities annually in the United States alone (5).

2. MATERIAL & METHODS

2.1. Study Design:

A Cross-sectional descriptive study was conducted from health care providers at Hayatabad medical complex

2.2. Study Setting:

The study was carried out HMC, Peshawar.

2.3. Study Duration:

The study was completed in 6 months.

2.4. Inclusion Criteria:

- Health care provider who are currently

practicing in hmc

- Individuals who voluntarily agree to participate in the study and provide informed consent.

2.5. Exclusion Criteria:

- Refusal to participate.
- Staff other than anesthesia health care provider

2.6. Sample size:

The number anesthesia care team in hmc is 117 and the sample size was calculated 90 by using openepi.com. by putting margin of error 5% and level of confidence 95%. Using this formula $n = p(1-p)(z/e)^2$.

2.7. Sampling Technique:

Convenient sampling

2.8. Data collection procedure:

This study was conducted in the duration of 6 months in hmc Peshawar.

2.8.1. Ethical approval:

After we received approval from the GSC head of department, permission was granted by the research ethical committee of hmc Data was collected from hmc.

2.8.2. Simple Collection:

After ethical committee approval data was recorded on a questionnaire after anesthesia providers experience reports in hmc. Questions include demographic information, WHO patient safety checklist, World Federation of Society of Anesthesia, and Anesthesia provider's experience.

2.9. Analysis Plan:

For data analysis, we use SPSS 26 (statistical package for the social sciences) and data was entered into the MS Excel spreadsheet.

3. RESULTS

Table No 4.1

Gender of participants				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Male	77	85.6	85.6	85.6
	Female	13	14.4	14.4	100.0
	Total	90	100.0	100.0	

In a group of 90 people, there are 77 males, making up about 85.6% of the total. On the other hand, there are 13 females, which is around 14.4%.

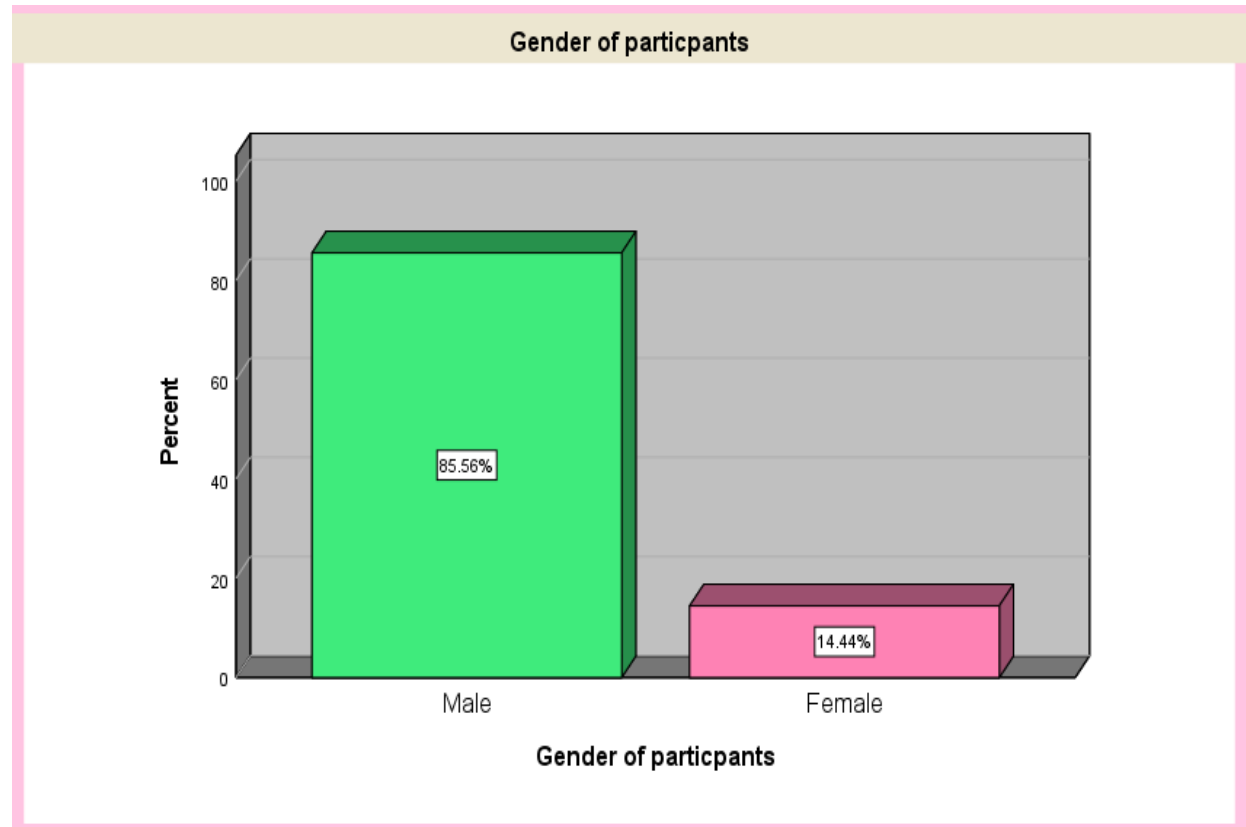


Table No 4.2

Designation of participants					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Technician	13	14.4	14.4	14.4
	Technologist	36	40.0	40.0	54.4
	Anesthesiologist	25	27.8	27.8	82.2
	Anesthesia Trainee	16	17.8	17.8	100.0
	Total	90	100.0	100.0	

In the sample of 90, we have 13 technicians (14.4%), 36 technologists (40.0%), 25 anesthesiologists (27.8%) and 16 Anesthesia trainee (17.8%).

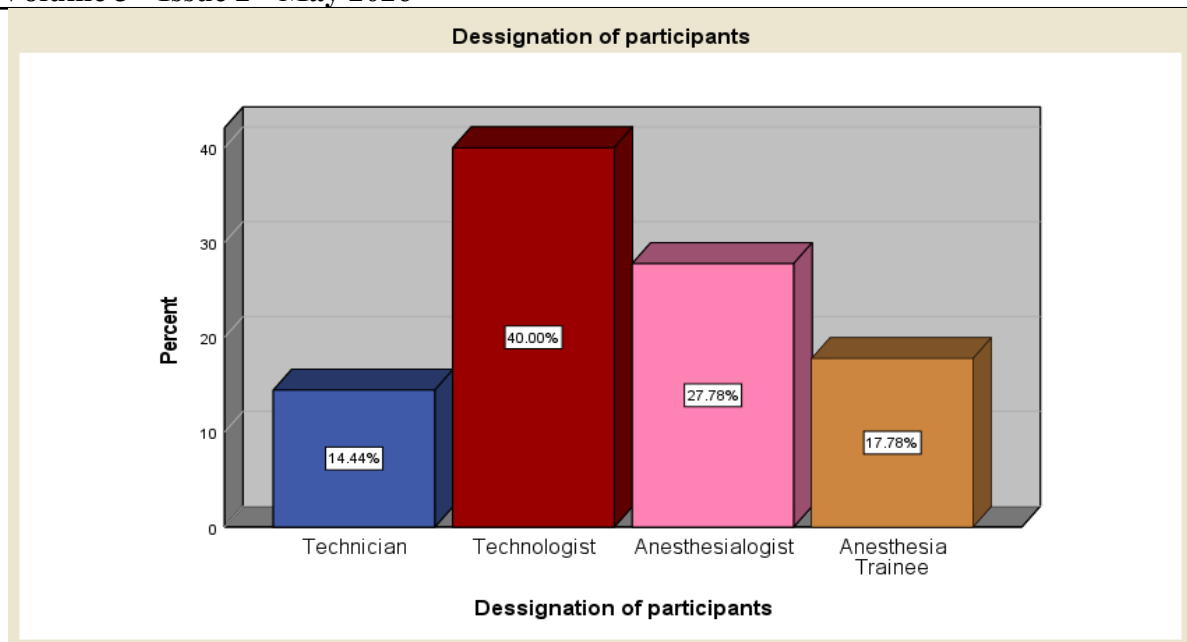


Table No 4.3

Are you familiar with the WHO anesthesia safety checklist					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	65	72.2	72.2	72.2
	no	25	27.8	27.8	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 65(72.2%) are familiar with WHO Anesthesia safety checklist as compared to 25(27.8%) respondents which is not familiar.

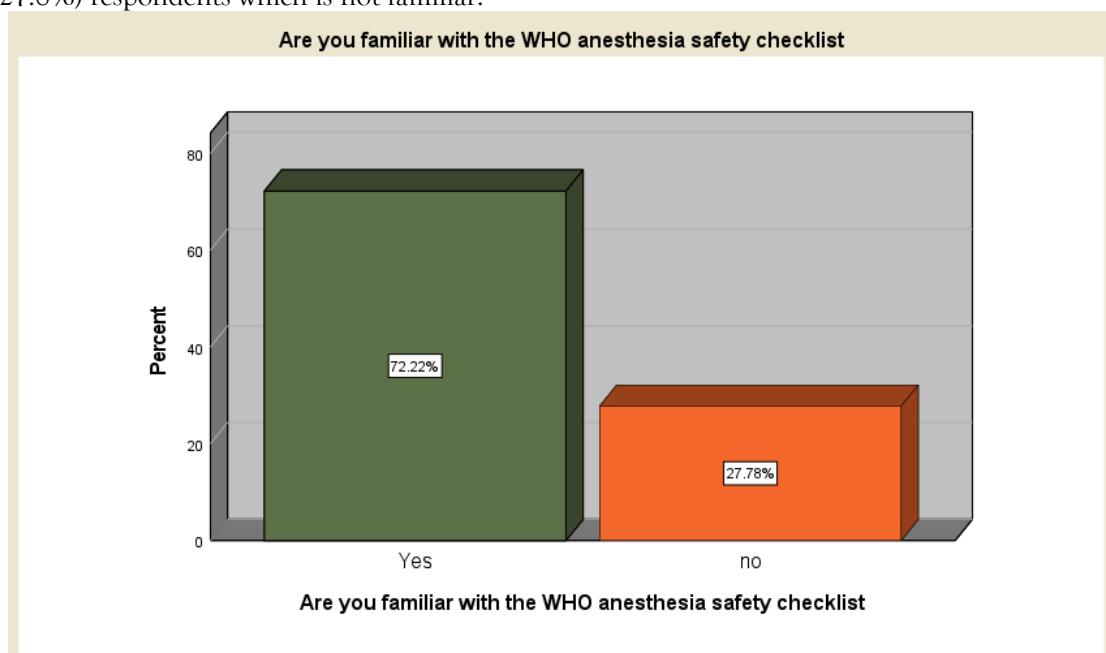


Table No 4.4

Do you know that patient identification must be confirm before anesthesia administration					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	84	93.3	93.3	93.3
	no	6	6.7	6.7	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 84(93.3%) are agree to patient identification before anesthesia administration as compared to 6(6.7%) respondents which is not agree.

Do you know that patient identification must be confirm before anesthesia administration

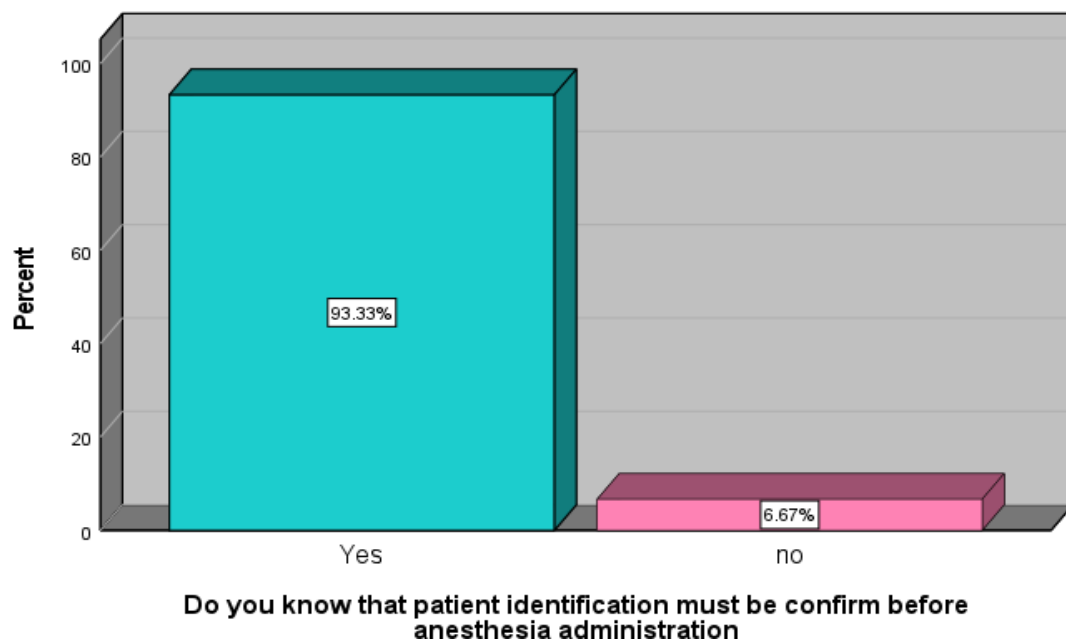
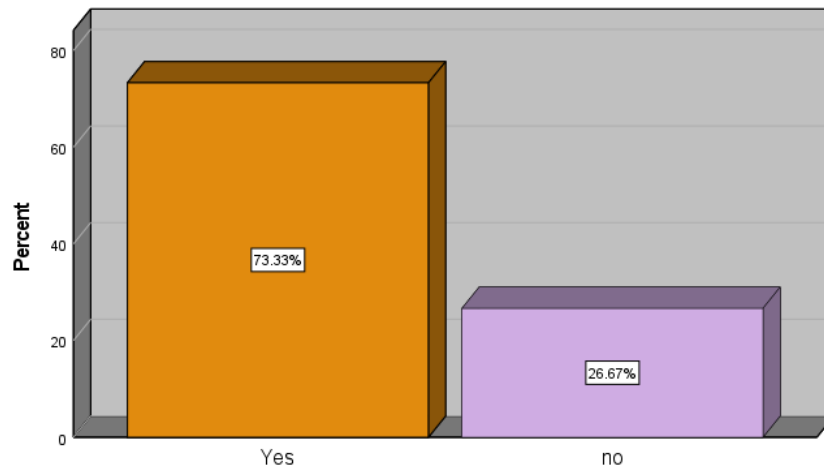


Table No 4.5

Are you aware that allergy status must be verified before administering anesthesia					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	66	73.3	73.3	73.3
	no	24	26.7	26.7	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 66(73.3%) are aware that allergy status must be verified before administering anesthesia as compared to 24(26.7%) respondents which are not aware.

Are you aware that allergy status must be verified before administering anesthesia



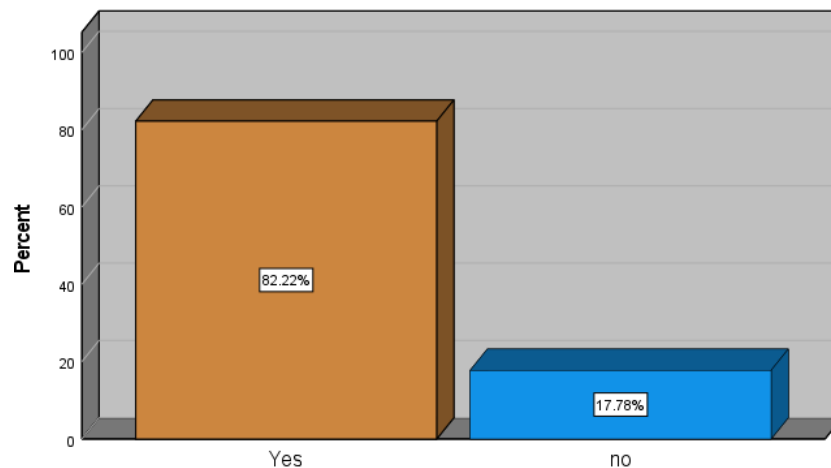
Are you aware that allergy status must be verified before administering anesthesia

Table No 4.6

Are you familiar with the patient safety goals specific to anesthesia					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	74	82.2	82.2	82.2
	no	16	17.8	17.8	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 74(82.2%) are familiar with the patient safety goals specific to anesthesia as compared to 16(17.8%) respondents which is not familiar.

Are you familiar with the patient safety goals specific to anesthesia



Are you familiar with the patient safety goals specific to anesthesia

Table No 4.7

Do you know the importance of obtaining informed consent before administering anesthesia				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Yes	72	80.0	80.0	80.0
	no	18	20.0	20.0	100.0
	Total	90	100.0	100.0	

Out of 90 respondents,72(80.0%) are familiar with the importance of obtaining informed consent before administering anesthesia as compared to 18(20.0%) respondents which is not familiar with the importance of obtaining informed consent before administering anesthesia.

Do you know the importance of obtaining informed consent before administering anesthesia

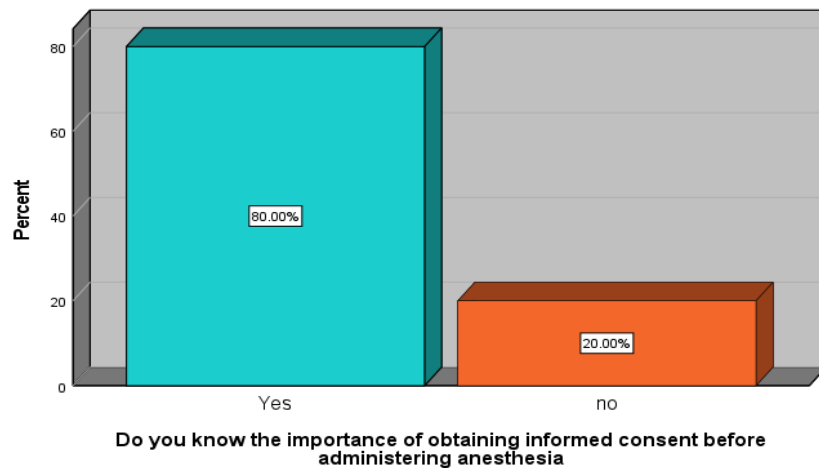


Table No 4.8

Are you familiar with protocol for managing a difficult airway					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	66	73.3	73.3	73.3
	no	24	26.7	26.7	100.0
	Total	90	100.0	100.0	

Out of 90 respondents,66(73.3. %) are familiar with protocol for managing a difficult airway as compared to 24(26.7%) respondents which are not familiar with protocol for managing a difficult airway.

Are you familiar with protocol for managing a difficult airway

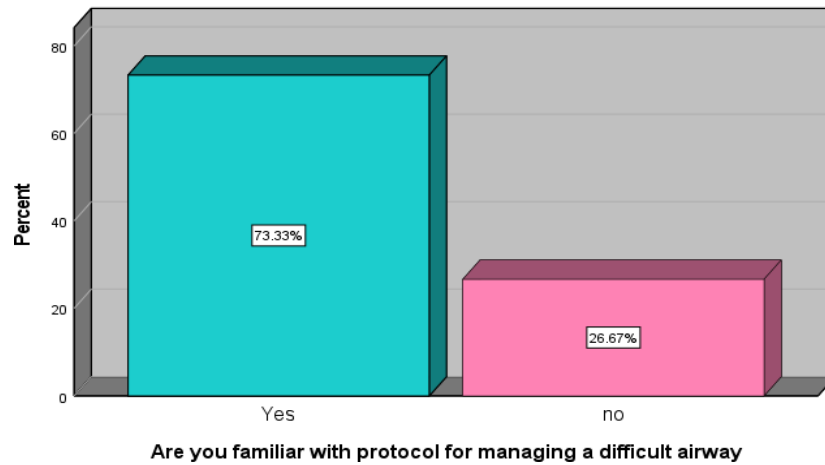


Table No 4.9

Do you know the importance of post anesthesia monitoring in preventing complication					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	68	75.6	75.6	75.6
	no	22	24.4	24.4	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 68 (75.6%) are aware about the importance of post anesthesia monitoring in preventing complication as compared to 22 (24.4%) respondents which are not aware about the importance of post anesthesia monitoring in preventing complication.

Do you know the importance of post anesthesia monitoring in preventing complication

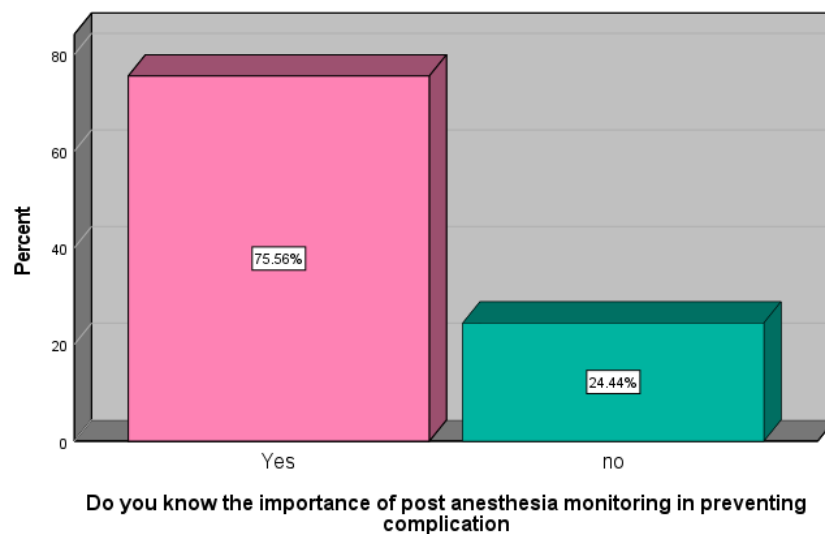
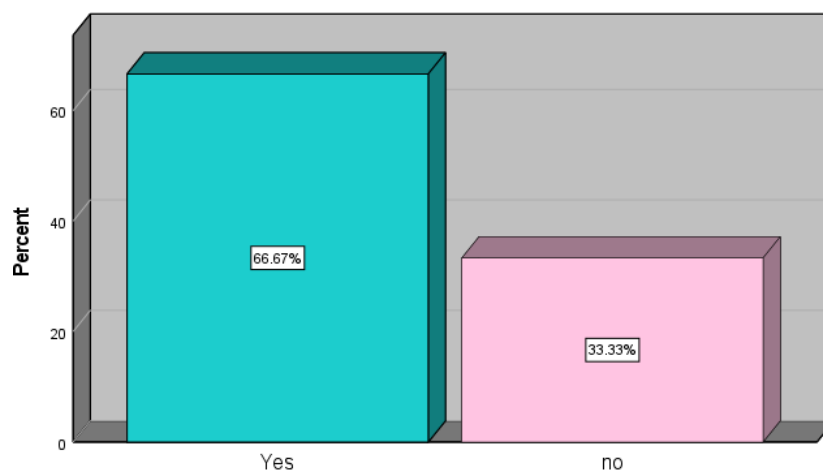


Table No 4.10

Do you always use WHO anesthesia safety checklist before starting anesthesia					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	60	66.7	66.7	66.7
	no	30	33.3	33.3	100.0
	Total	90	100.0	100.0	

Out of 90 respondents,60(66.7%) always use WHO anesthesia safety checklist before starting anesthesia as compared to 30(33.3%) respondents which are not always use WHO anesthesia safety checklist before starting anesthesia.

Do you always use WHO anesthesia safety checklist before starting anesthesia



Do you always use WHO anesthesia safety checklist before starting anesthesia

Table No 4.11

Do you perform an equipment safety check before every anesthesia procedure					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	74	82.2	82.2	82.2
	no	16	17.8	17.8	100.0
	Total	90	100.0	100.0	

Out of 90 respondents,74(82.2%) perform an equipment safety check before every anesthesia procedure as compared to 16(17.8%) respondents which are not perform an equipment safety check before every anesthesia procedure.

Do you perform an equipment safety check before every anesthesia procedure

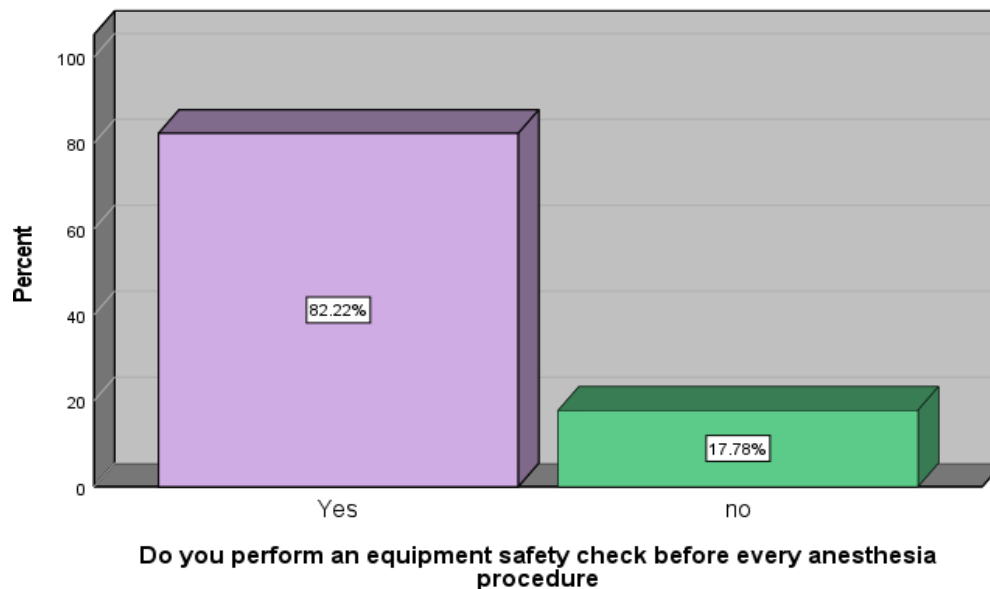


Table No 4.12

I always ensure that the anesthesia safety checklist is completed before starting a anesthesia procedure					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	57	63.3	63.3	63.3
	no	33	36.7	36.7	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 57 (63.3%) always ensure that the anesthesia safety checklist is completed before starting an anesthesia procedure as compared to 33 (36.7%) respondents not ensure that the anesthesia safety checklist is completed before starting an anesthesia procedure.

I always ensure that the anesthesia safety checklist is completed before starting a anesthesia procedure

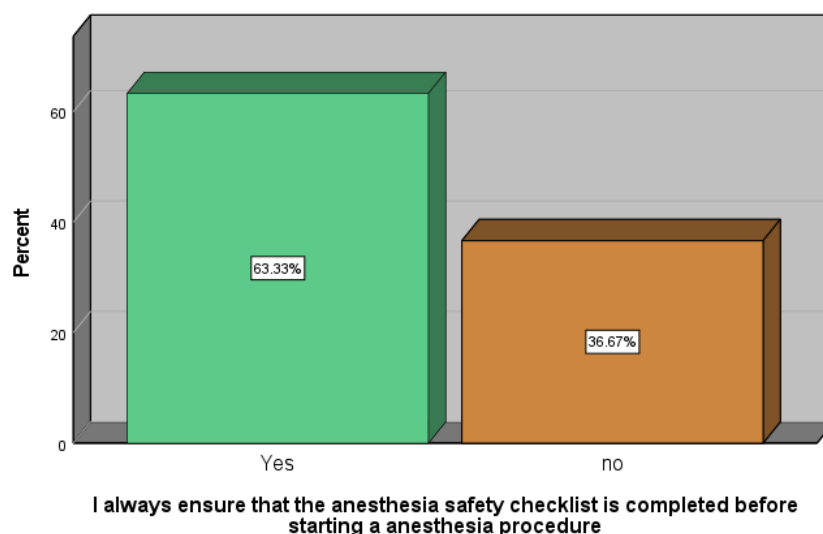
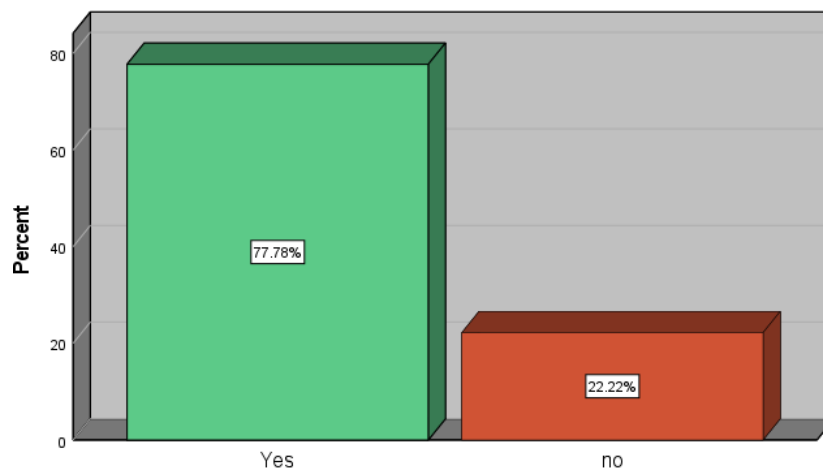


Table No 4.13

Do you monitor the patients vital signs continuously during anesthesia					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	70	77.8	77.8	77.8
	no	20	22.2	22.2	100.0
	Total	90	100.0	100.0	

Out of 90 respondents,70(77.8%) always monitor the patient's vital signs continuously during anesthesia as compared to 20(22.2%) respondents not monitor the patient's vital signs continuously during anesthesia.

Do you monitor the patients vital signs continuously during anesthesia



Do you monitor the patients vital signs continuously during anesthesia

Table No 4.14

Do you consistently verify that all drugs used in anesthesia are correctly labeled and stored					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	36	40.0	40.0	40.0
	no	54	60.0	60.0	100.0
	Total	90	100.0	100.0	

Out of 90 respondents,36(40.0%) always consistently verify that all drugs used in anesthesia are correctly labeled and stored as compared to 54(60.0%) respondents not consistently verify that all drugs used in anesthesia are correctly labeled and stored.

Do you consistently verify that all drugs used in anesthesia are correctly labeled and stored

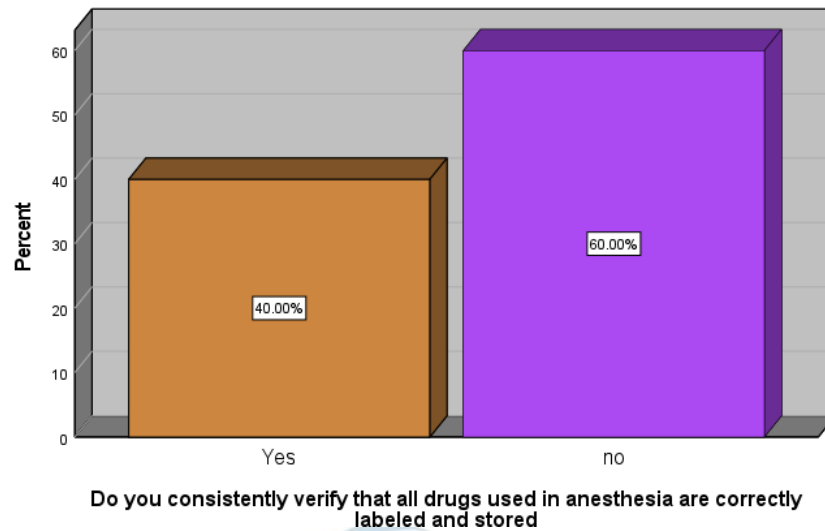


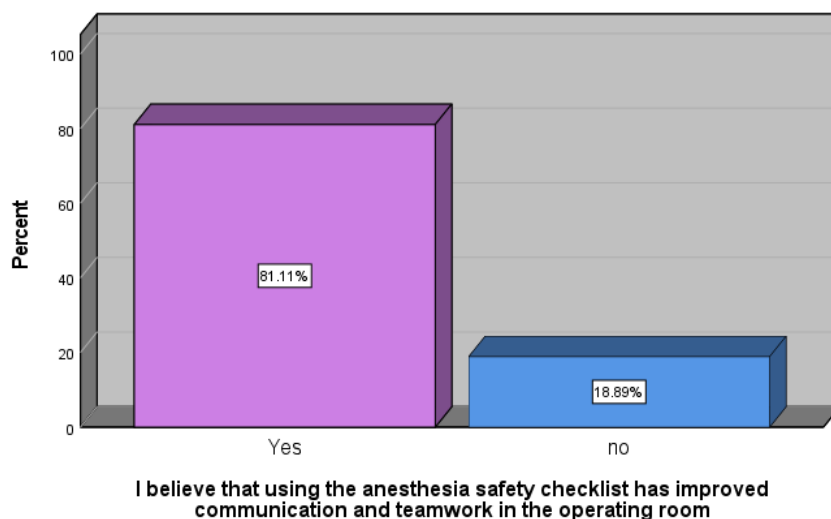
Table No 4.15

I believe that using the anesthesia safety checklist has improved communication and teamwork in the operating room

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	73	81.1	81.1	81.1
	no	17	18.9	18.9	100.0
	Total	90	100.0	100.0	

Out of 90 respondents, 73 (81.1%) believe that using the anesthesia safety checklist has improved communication and teamwork in the operating room as compared to 17 (18.9%) respondents who do not believe that using the anesthesia safety checklist has improved communication and teamwork in the operating room.

I believe that using the anesthesia safety checklist has improved communication and teamwork in the operating room



4. DISCUSSION:

The evaluation of anesthesia practitioners' proficiency and understanding of anesthesia safety checklists in operating rooms (OT+ICU) at hmc a knowledge and practice study conducted in Peshawar, Pakistan, provides valuable insight into the opinions and experiences of occupational therapy personnel with relation to this vital instrument for enhancing anesthesia safety.

Use of compliance with the Anesthesia safety checklist

Notably, though, a few respondents disagreed or expressed no opinion regarding their compliance. This discrepancy in adherence highlights the necessity of continual oversight and encouragement of the use of safety checklists in order to guarantee their uniform implementation in surgical practice.

The comparison between our survey and the provider survey on perceptions with routine checklists.

A total of 142 anesthetists completed the questionnaire. The participants were mostly women (52.1%) with a mean age of 44.28 ± 8.01 years. Most of them were working for more than 10 years (54.9%); the mean working time was 12.83 ± 7.76 years. There was no statistical difference among the participants regarding sex, age and working years. They were employed by state hospitals (46.5%), university hospitals (40.1%) and private hospitals (13.4%).

Education about patient safety was received by 58.5% of the participants, which was provided by private (68.4%), university (64.9%) and state hospitals (68%). Training and research hospitals had the lowest ratio of participants receiving the education (39%, $p=0.028$). It is claimed that 59.9% of the institutions provide patient safety education; however, in 57% of them, issues regarding human factors associated with patient safety were not taught. Private hospitals had higher human factor education ratios ($p=0.016$). The knowledge about the Helsinki declaration was limited, whereas knowledge about patient safety was sufficient (Figures 1 and 2). A total of 69% of the participants could not define the Helsinki declaration correctly(19).

We obtained some results from our survey in comparison to this research. In a group of 90 people, there are 77 males, making up about 85.6% of the total. On the other hand, there are 13 females, which is around 14.4%. In that survey, we have 13 technicians (14.4%), 36 technologists (40.0%), 25anesthesiologist (27.8%) and 16

Anesthesia trainee (17.8%). Out of 90 respondents, 65(72.2%) are familiar with the WHO Anesthesia safety checklist as compared to 25(27.8%) respondents who are not familiar.

Perceived impact on communication and teamwork

The majority of respondents acknowledged that the ASC improves teamwork and communication in the operating room. The ASC's main goals are better teamwork and communication, both of which increase patient safety. However, other respondents were either neutral or disagreed with the ASC's impact on these factors. These results imply that there may be opportunities to improve communication and teamwork in particular situations or that more work is necessary to guarantee that ASC continuously improves these essential components of anesthesia practice.

CONCLUSION

Overall, the majority of respondent expressed positive attitudes towards the checklist, its value, and its potential to improve patient safety. Additionally, a significant number of respondents reported a commitment to ensuring the completion of the checklist before surgeries and acknowledged its contribution to enhanced communication and teamwork in the operating room. Furthermore, a substantial percentage believed that the checklist led to a reduction in anesthesia error or complications. However, there are areas where respondents indicated less certainty, particularly in their ability to identify the checklists phases and the specific purpose of –Sign-inll phase. This suggests a need further education and training to enhance checklist comprehension among (OT+ICU) staff.

In light of these findings, it can be concluded that the WHO anesthesia safety of the staff at

hmc These results highlight the checklists potential patient safety, improve teamwork, and reduce anesthesia errors. The study underscores the importance of continued education and training to ensure full understanding and implementation of the checklist in anesthesia practice. These findings can inform efforts to promote checklist utilization and strengthen anesthesia safety practice with in the institution.

Limitations:

Participants were chosen from three particular institutions hmc, which may not accurately reflect the procedures or expertise of anesthesiologists in other hospitals, particularly those in smaller or more rural areas. As a result, the findings might not be generalizable to all medical institutions.

The research only looks at anesthesiology doctors, although a multidisciplinary team is involved in patient safety. It may have provided a more comprehensive view of patient safety procedures to incorporate feedback from other medical specialists (such as surgeons, nurses, and technicians).

RECOMMENDATION

Implement a Standardized Checklist: Use a thorough and standardized checklist, such the "Anesthesia Safety Checklist" or ones based on the Safe Surgery Checklist from the World Health Organization (WHO), which contains essential stages for both intraoperative management and preoperative preparation.

Preoperative Patient Assessment: Verify the patient's identity, the anesthesia strategy, and the surgical technique. The patient's medical history, allergies, comorbidities, and other dangers associated with anesthesia should all be covered in the checklist.

Confirm Informed Consent: Confirm that informed permission has been acquired and recorded for the procedure and anesthesia.

Equipment and Drug Verification: Make sure all required medications, supplies, and equipment are on hand and in working order. This involves making that the right drugs,

doses, and anesthesia equipment are used.

Enhanced Training Programs: To guarantee that all healthcare personnel are knowledgeable about the most recent rules and procedures, provide regular training sessions centered on best practices. This should incorporate practical workshops and skill-reinforcement simulations.

Training on Checklist Use: All members of the anesthesia team should get regular training on the significance and proper application of the checklist. Effective use of the checklist during each anesthesia phase and how to record the outcomes should be covered in training.

Electronic Checklists: Use easily accessible, updated, and trackable electronic checklists in situations where technology permits. In the event that crucial tasks are overlooked, these systems can also alert users.

Mentorship and Peer Support: Create mentorship programs in which seasoned medical experts assist less experienced employees. This could increase adherence to safety procedures and promote a culture of learning.

Increased Awareness Campaigns: Start internal awareness efforts to draw attention to the safety checklist control procedures and their direct influence on patient safety and healthcare results.

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