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Research Article

Impact of Surgical Safety Practices on Surgical Quality Performance with the Mediating Role of Safety Compliance Behavior in Public Sector Hospitals of Pakistan

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Abstract: Surgical safety is a long-standing challenge in LMICs, where preventable adverse events are a significant burden on patients and an already overburdened health system. Objective: To investigate the effect of surgical safety practices on surgical quality performance by considering the mediating role of safety compliance behavior in public sector hospitals of Pakistan. ***Methods:*** This is a cross sectional, correlational design. A structured questionnaire was given to 100 health care professionals (including surgeons, anesthetist, nurses and residents) from DHQ and teaching hospitals. ***Results***: Safety practices were not consistent, with only 16% saying they always or usually used the WHO Surgical Safety Checklist and 43% rarely or never confirmed the identity of their patients before surgery. Safety compliance behavior was also poor as 48% of the respondents disagreed that they comply with safety procedures. Results were equally disappointing, as 43% of the respondents experienced frequent 30-day mortality and 42% experienced frequent postoperative complications. ***Conclusion:*** Surgical safety practices are poorly adhered to, surgical safety compliance behaviour is highly affected and surgical quality performance is highly compromised. Systemic culture change to improve safety compliance behaviour is key to improving surgical outcomes in the public sector in Pakistan.

Keywords: Surgical Safety Practices; WHO Surgical Safety Checklist; Safety Compliance Behavior; Surgical Quality Performance; Patient Safety; Public Sector Hospitals; Pakistan; Low- and Middle-Income Countries; Operating Room Safety; Mediating Role.

INTRODUCTION

Surgical care is a fundamental component of healthcare, from life-saving interventions to elective surgeries that enhance quality of life. The World Health Organization (WHO) estimates that surgical conditions make up > 30% of the disease burden worldwide, and nearly 5 billion people do not have access to safe, affordable surgical and anesthesia care where and when they need it [3,14]. This access disparity results in a significant amount of preventable morbidity and mortality, especially in low and middle income countries (LMICs) where the poorest one-third of the world's population only receives around 6% of the world's surgery [14]. The Lancet Commission on Global Surgery has demonstrated that provision of safe surgery and anesthesia care can save lives as well as have a positive impact on economic development [14]. Nevertheless, inequity in delivery of surgical services is among the most challenging issues facing the delivery of global health services today.

Surgical safety has become a much greater focus in the last 20 years as evidence has increasingly emerged about the burden of preventable adverse events and complications on patients, health systems and society. Despite improvements in technology and knowledge of the human body, errors such as operating on the wrong site, foreign body retention, and surgical site infection persist in compromising patient outcomes [9]. To overcome this, WHO introduced the campaign ‘Safe Surgery Saves Lives' in 2008 and developed the Surgical Safety Checklist (SSC) with a total of 19 items to improve team work, reduce the risk of surgery and to promote OR culture of safety [27]. Since then, this checklist has been adopted and adapted in several healthcare settings in high-income countries and LMICs, and a vast amount of research has shown that its potential to have a significant impact on morbidity and mortality exists [4].

Yet, research has shown significant variation in the effectiveness of implementation of the checklist and

associated safety practices, influenced by cultural, institutional and procedural factors [4]. This diversity is most noticeable in situations where health systems are continually faced with a lack of trained staff, equipment and functioning infrastructure [8]. For decades, many civil war contexts like Somalia have affected health systems, leaving them with a lack of trained staff and functioning surgical units, and surgical staff operating in extreme conditions with limited supervision [8]. Although 80 % of hospitals in Ethiopia have adequate infrastructure on paper, site visits find inconsistencies in the provision of post-anesthesia care design, sterilization services and availability of equipment for the provision of maternal and child health services and only 77 % of hospitals routinely implement patient monitoring and handover protocols [11].

Pakistan, a lower-middle income country over 240 million people, has similar issues in providing surgical safety and quality. Its public sector hospitals that cater to the majority of the population face severe resource limitations: Under-staffing is common, equipment is inadequate, and basic safety measures are not standardized. Studies in tertiary care hospitals in Pakistan have reported low adherence to a number of items in the WHO checklist including documenting allergy history (26.3%), assessment of risk for blood loss (15.3%) and introduction of members of the team (62.6%) [23]. The results indicate that there is a strong need for a systematic study of the factors influencing surgical safety practices and their impact on surgical quality performance in Pakistan.

Surgical safety practices and surgical quality performance is based on a relatively obvious premise: If evidence-based safety practices are adhered to, the conditions will be set for better surgical quality outcomes. How it is translated, particularly in LMICs, is less known. Safety compliance behavior, defined as the extent to which healthcare professionals consistently engage in safety practices or protocols while at work with patients, has been suggested as the mechanism through which institutional safety practices are linked with clinical outcomes [7,15]. With professionals absorbing the safety measures and following them regularly, the desired impact is more likely to manifest itself in better quality surgery. If compliance is superficial or not consistent, that potential is not realized, however, [24].

A common concern from published literature is ritualistic application of the surgical safety checklist in which it is completed for administrative reasons and not necessarily used as a communication and safety tool [19,24]. This type of ritualistic behavior can actually defeat the safety benefits of the checklist by allowing what the checklist was meant to prevent to occur, and communication and safety benefits are not realized [19]. It draws attention to the importance of not only having safety systems in place, but practicing them in a manner that is truly compliant and will enhance quality.

Thus, the role of safety compliance behavior as a mediator in this relationship is theoretically and practically important. While the direct link between safety practices and outcomes has been widely studied, so has the behavioral mechanisms that underlie this relationship, though to a lesser extent in low to moderate income environments. If it can be determined that safety compliance behavior is a mediator in this relationship then interventions should be aimed at both the structural elements in the implementation of safety practices and the behavioral and cultural aspects that influence the effectiveness of safety practices.

This thesis seeks to fill this gap by exploring the impact of surgical safety practices on surgical quality performance in the public sector hospitals of Pakistan with special emphasis on the mediating role of surgical safety compliance behavior. The study of these relationships in the context of the public healthcare system in Pakistan is intended to provide evidence for policy, quality improvement initiatives and eventually for enhancing patient safety and surgical outcomes in constrained resources.

2. BACKGROUND

2.1 The Global Burden of Unsafe Surgical Care

Surgical care can treat a myriad of health concerns, but the burden of unsafe surgical care is significant everywhere in the world. Surgical complications occur in millions of patients annually, and perioperative complications are estimated to happen in about 3-25% of surgeries according to the type of surgery and the setting in which it is performed [26]. The incidence of major perioperative complications in high-income countries is approximately 3% to 16%, but much higher – more than 20% in some settings – in LMICs [16,26].

Surgical site infections (SSIs) are one of the most common and most preventable complications associated with surgery. They are estimated to occur in 2-5% of surgical patients worldwide, of which prevalence is up to 50% in parts of South Asian region (including Pakistan) due to inadequate infection control measures [12]. SSIs lengthen inpatient stays, result in greater morbidity, higher healthcare expenses and can be fatal in severe cases [12]. MRSA is a significant contributor of these infections and treatment is made difficult due to MRSA's ability to withstand common antibiotics [12].

Unsafe surgical care has repercussions far beyond the immediate patient injury. Complications result in longer hospital stays, more procedures and a longer recovery period, which increases costs and decreases productivity [14]. The Lancet Commission on Global Surgery has estimated that expanded surgery in LMICs could be a significant economic gain with a benefit-cost ratio (BCR) of up to 10:1 over a period of 15 years [14]. Unsafe surgical care, if left unaddressed, only creates a cycle of poor health and poverty as families bear the financial and social burden of unanticipated and preventable harm.

2.2 Surgical Safety Practices Beyond the Checklist

The WHO checklist has received lots of attention but surgical safety is not only about safe surgery but also about preoperative assessment and optimization, infection-prevention strategies including antibiotic prophylaxis, hand hygiene, safe anesthesia practice, team communication, handover and postoperative monitoring [22,27]. All these practices comprise the backbone of safe surgical care and should be consistently applied for good surgical outcomes.

Surgical safety practices are multi-layered: the individual surgeon (following evidence-based practices), the team (communication and coordination), the institution (policies, procedures, resources) and health system (governance and culture). These layers must complement each other in order to provide effective surgical safety [15].

In a resource-constrained environment like Pakistan, the implementation of full surgical safety practices is actually challenging due to a lack of infrastructure, supplies, trained personnel, high volume of patients and limited institutional support for quality improvement [12,23]. Studies in Pakistan hospitals have identified that only 8% of facilities screen all surgical patients for MRSA, 46% of the facilities did not screen patients for MRSA at all, and only 38% of them attained 51-70% hand hygiene adherence [12]. Such lacunae in the practice of basic safety stresses the importance of systematic interventions to improve surgical safety in Pakistan.

2.3 Surgical Quality Performance: Conceptualization and Measurement

Conceptualization and Measurement focuses on the current state of understanding regarding how to conceptualize and measure surgical quality performance.

Surgical quality performance is the degree to which surgical services attain a good outcome and follow evidence-based standards of care. Over the last 20 years, the understanding and assessment of quality has evolved significantly from examining mortality and morbidity rates to considering a wide range of indicators related to structure, process and outcomes. Structure indicators include facilities, equipment, and trained staff; Process indicators include following evidence-based protocols; and Outcome indicators include death, complications, and patient-reported outcomes.

Agency for Healthcare Research and Quality has created Patient Safety Indicators (PSIs) commonly adopted for surgical quality measurements such as postoperative complications (deep vein thrombosis, pulmonary embolism, wound dehiscence, and accidental puncture/laceration) [1]. Surgical site infection rate, unplanned return to operation room, readmission rate and length of stay are commonly used indicators as well [18,22].

The integration of patient perspectives is a reflection of a more general principle that quality care in surgery should be patient responsive, as well as clinically effective [28].

There are also unique challenges to collecting and analysing surgical quality in LMICs, including the lack of robust data collection infrastructure, suboptimal documentation of surgical procedures and limited resources for accessing, extracting and analysing surgical quality indicators. However, due to these challenges, we acknowledge the need for systematic quality measurement in LMICs for identifying gaps and monitoring progress and guiding resource allocation [14].

2.4 The Pakistani Healthcare Context

Pakistan is a lower-middle income South Asian country with a population of over 240 million – the fifth most populated in the world. It has a mix of public and private healthcare service providers, the majority of the population being served by public providers, particularly those in the lower socio-economic groups and people in rural areas. The public system includes three tier primary (Basic Health Units, Rural Health Centers), secondary (Tehsil and District Headquarters Hospitals) and tertiary (teaching Hospitals, Specialized institutes).

However, low investment, poor infrastructure, limited trained staff and less activity on quality improvement remain as the challenges for public health in Pakistan [12,23]. The World Health Organization estimates that Pakistan is spending around 3% of GDP on health, which is less than the 5% recommended for universal health coverage. This underinvestment is reflected directly in the shortage of medicines and equipment, lack of access to specialized care and lack of infection prevention and control.

Surgical care in public hospitals is provided under a lot of pressure in Pakistan. There can be lack of equipment in operating rooms, sterility cannot be guaranteed, and surgical teams lack in support and are overloaded [23]. However, significant compliance gaps with checklists have been reported. One closed-loop audit at a tertiary public hospital in Peshawar revealed that certain aspects of the checklist were followed well, such as confirmation of patient identity (95.6%), informed consent (94.5%) and sponge/instrument counts (95.6%) while others were poorly followed such as documentation of allergies (26.3%), evaluation of risk of blood loss (15.3%) and introduction of team members (62.6%) [23].

2.5 Theoretical Framework

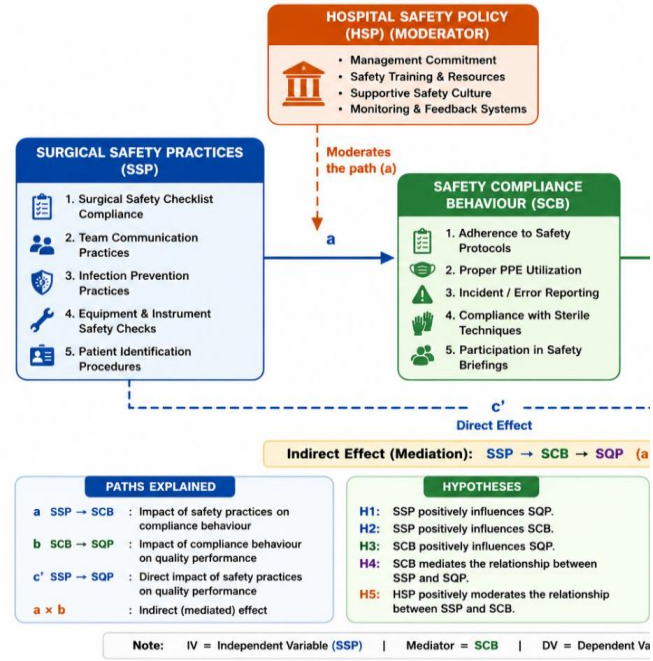

Figure 1. Theoretical framework depicting the hypothesized relationship between surgical safety practices, safety compliance behavior, and surgical quality performance.

3. PROBLEM STATEMENT

Public sector hospitals in Pakistan exhibit a lack of consistent practice of surgical safety and have shown low rates of surgical quality with high complications and adverse events. Little is known about the mechanisms of how safety practices influence quality performance, including the mediating role of safety compliance behavior. Clearly, there is a need for empirical studies on such relationship in the context of Pakistan to produce evidence for designing interventions to enhance surgical safety and quality.

This problem statement represents various interrelated concerns: an implementation gap (inconsistent safety practices), a quality gap (poor surgical outcomes), a mechanism gap (limited understanding of the pathways linking implementation and quality gap) and a contextual gap (limited Pakistan-specific evidence). This research aims to tackle these interlinked issues and produce knowledge that can assist in enhancing surgical safety and quality in public sector hospitals of Pakistan.

4. RESEARCH QUESTIONS

4.1 Primary Research Question

How surgical safety practice influences surgical quality performance in public sector hospitals in Pakistan and does compliance behavior mediate this influence?

4.2 Secondary Research Questions

1. What is the state of the implementation of surgical safety practice in public sector hospitals of Pakistan?
2. What is the level of safety compliance behavior among healthcare professionals in public sector hospitals of Pakistan?
3. What is the current level of surgical quality performance in public sector hospitals of Pakistan?
4. What is the magnitude of direct impact of surgical safety practices on surgical quality performance in public sector hospitals of Pakistan?
5. Do the surgical safety practices have a considerable direct association with surgical safety compliance behavior in public sector hospitals of Pakistan?
6. What is the strength of the direct association between safety compliance behavior and the surgical quality performance in public sector hospitals of Pakistan?

5. LITERATURE REVIEW

This chapter discusses the literature pertaining to the surgical safety practices, safety compliance behavior and surgical quality performance in light of public sector hospitals in low- and middle-income countries including Pakistan. It's thematically organized. It starts with the world burden of unsafe surgical care and the establishment of surgical safety as a global health priority, and moves on to the development, evidence basis and implementation issues of the WHO Surgical Safety Checklist. It then considers the behavior of safety compliance, theory, and the suggested mediating effects between safety practices and the quality outcomes. Surgical quality performance its conceptualization and measurement and the factors that influence it are also examined. It concludes with a summary of the findings of surgical safety in the context of Pakistan and areas where this study fills the void.

5.1 The Global Burden of Unsafe Surgical Care

Surgical conditions account for a significant and increasing proportion of the worldwide burden of disease. It is estimated that approximately five billion people have no access to safe, affordable surgery and anesthesia services in the event of a need, and the majority of these are in LMICs [14]. Every year, it is estimated that 234 million major surgical operations are performed worldwide, with nearly 7 million patients developing disabling complications and some 1 million dying during or immediately after surgery. Half of all of these adverse events are believed to be avoidable by improving the practice and safety of surgery.

This burden is particularly heavy on patients in LMICs where morbidity and mortality rates are significantly higher than in high-income countries. Operating in LMICs, surgical patients are estimated to be 100- to 1,000-fold more likely to experience complications, including those stemming from a combination of poor infrastructure, staffing shortages, equipment limitations, and insufficient quality improvement systems.

Surgical site infections (SSI) continue to be one of the most common and most preventable complications of surgical care with incidence of 2–5% globally and up to 50% in certain parts of south Asia such as Pakistan [12]. These result in prolonged hospitalisation, increased morbidity, increased costs and death in severe cases. MRSA has been a significant part of such infections, and

complicates treatment due to the antibiotic resistance [12].

There are costs to health care that goes beyond the individual patient when surgical care is unsafe. Complications usually result in increased hospital stays, increased interventions and prolonged recovery, leading to increased health care costs and lost productivity [14]. In LMICs, scaling up surgery services has been estimated to provide a benefit cost ratio of up to 10:1 over 15 years [14]; on the other hand, if the safety of surgery is not addressed, its costs will help perpetuate cycles of poverty and poor health, as families bear the burden.

Such recognition has stimulated international initiatives to improve surgical safety, such as the World Health Organization (WHO) "Safe Surgery Saves Lives" campaign and the development of the Surgical Safety Checklist, which has fostered an increased awareness that surgical safety is not only a clinical matter but also essential to health care quality and global health equity.

5.2 The WHO Surgical Safety Checklist: Development and Evidence

5.2.1 Development and Conceptual Framework

The WHO Surgical Safety Checklist is a huge leap in improving surgical safety worldwide. It was developed jointly by surgeons, anesthesiologists, nurses, and patient safety experts, and is a 19 item checklist that is filled out at three important times during surgical care: before induction of anesthesia (Sign In); before skin incision (Time Out); and before patient leaves the operating room (Sign Out) [27].

The checklist was developed from the understanding that surgical mistakes are typically a result of systemic failures and that structured communication and verification decreases the chances of preventable surgical complications [9]. It covers common and potentially serious errors, and establishes minimum standards that should be adhered to in all surgical environments [27] such as: checking patient identity, surgical site, and procedure; checking for risk of major blood loss and difficult airway; checking equipment availability and blood products; giving prophylactic antibiotics and planning for postoperative care.

It has a teamwork, communication and situational awareness concept in the operating room. The checklist is designed to create a safety culture where team members are comfortable raising concerns and risks at important stages of the surgical procedure [9].

5.2.2 Evidence of Effectiveness

There is a large body of evidence in support of the effectiveness of the checklist. The WHO Safe Surgery Saves Lives Study Group revealed that mortality rates decreased from 1.5% to 0.8% and rates of inpatient complications decreased from 11.0% to 7.0% for eight hospitals in various countries globally following its implementation [9]. The study, published in the New England Journal of Medicine, was the base on which the checklist was spread around the world.

Later studies have continued to corroborate its effectiveness. In the systematic review and meta-analysis by Qaiser et al. [17] 17,821 papers were screened and 13 methodologically suitable studies were identified, of which nine of ten studies reporting complication rates demonstrated a decrease and 12 of 13 studies reporting mortality rates showed a decrease after checklist use. The review found that the checklist enhances surgical outcomes, leading to a reduction in postoperative mortality and complications.

A related systematic review by Alsadoun et al. [4] included randomized controlled trials, qualitative research and meta-analysis, and targeted the checklist's impact on complications and safety culture among surgical teams. It verified the effectiveness of the checklist, but also identified significant variation in the quality of implementation, which was influenced by factors such as culture, institutional structures and procedures.

A prospective cohort study (International Surgical Outcomes Study) of 44,814 patients from 497 hospitals in 27 countries reported that checklist use was linked to a decrease in deaths (OR 0.49, 95% CI 0.32-0.77; $p<0.01$) but not to a significant change in complication rates (OR 1.02, 95% CI 0.88-1.19; $p=0.75$) [13]. In a larger meta-analysis, which included this group of 453,292 patients, checklist exposure was associated with lower postoperative mortality (OR 0.75, 95% CI 0.62–0.92; $p < 0.01$) and lower complication rates (OR 0.73, 95% CI 0.61–0.88; $p < 0.01$) [13]. The authors cautioned that the improved results of checklist users might partially be due to other differences on quality of care at hospitals where checklist use is well established.

5.2.3 Implementation Challenges and Variability

Nevertheless, there is a significant variation in the quality of implementation and compliance. A systematic review and meta-analysis found the overall compliance rate in Sign In, Time Out and Sign Out to be 73% (95% CI 62-85%), 76% and 61%, respectively [21]. Overall checklist implementation completeness was low (51%), indicating significant lack of consistency of use of all checklist items.

This variability is a result of what is provided by the institution, the engagement of leadership, training, team dynamics, and the overall safety culture in surgical departments [4]. Other barriers that exist in resource-limited environments are lack of infrastructure, lack of staffing, high workload, and other clinical priorities [8,11].

It has also been found that teams complete checklists without real communication or engagement, or in a "ritualistic" manner [19,24]. This type of compliance can actually be a sign of poor compliance and undermine what safety practices are intended to provide, emphasizing the importance of evaluating safety

practices not only if they are done, but how. This ritualization the removal of the ritual from underlying patient safety goals – has been identified as an important issue in surgery.

5.2.4 Implementation in Low- and Middle-Income Countries

There are particular difficulties in implementing the checklist in LMICs that relate to the wider challenges these health systems face. In a study in Somalia, a weak health system that has come out of decades of civil war, compliance with all the checklists increased from 51.38% during the first audit to 93.01% during the second, after a structured intervention that included targeted staff education, increased leadership engagement, and visual reminders [8]. Items that required anticipatory planning (ABL, risk assessment of major blood loss) had less improvement than other items. The authors concluded that low cost, context-sensitive intervention can have a substantial effect on checklist adherence – even in a resource-poor setting.

A descriptive observational study in Nepal revealed that the checklist was only used in 48.7% of cases; in only 8.7% of all cases the checklist was fully adhered to [20]. The highest utilization rate was seen for the pre-procedure check (63%) and lowest for Sign Out (29.3%) with verbal confirmation (70.2%) being more common than written confirmation. The authors of the study found that while checklists have been shown to be beneficial, that there is not a high level of adherence to them and that targeted training and regular audits will be required to boost adherence to checklists and patient safety in resource-limited areas.

A multicenter audit of compliance of operating room staff with the checklist in a LMIC showed that the checklist was fully completed for only 27.9% of patients; 43.2% for whom it was partially completed, and 28.8% left blank [29]. All patients in the governmental hospital had partial checklist filled and none in the nongovernmental hospital had blank one. Top barriers to implementation reported by staff were lack of time (56.3%), staff assertiveness (55.0%) and training (53.8%). Attitudes to the checklist were mostly positive, the authors wrote, but some of these obstacles could be overcome by targeted education to enhance the quality of implementation.

When considered as a whole, these results suggest a significant gap in implementation in LMIC settings and highlight the need to better understand the context surrounding adherence to surgical safety practices. The evidence points to the fact that, despite the promise of the checklist, its potential to improve outcomes in LMICs will only be realized if sustained effort is put in to overcome the system, cultural and resource-related obstacles that hinder consistent use.

5.3 Safety Compliance Behavior: Conceptualization and Theoretical Foundations

5.3.1 Defining Safety Compliance Behavior

Safety compliance behavior is defined as the extent to which healthcare professionals consistently perform established safety protocols, procedures and recommendations in their daily work. The approach is based on organizational behavior and safety science (e.g., Griffin and Neal, 1978 [7] who made a distinction between safety compliance, which is the extent of adherence to safety procedures, and safety participation, which is the extent to which a person is involved with safety-related activity beyond the formal requirements).

Griffin and Neal [7] theorized the two-dimensional nature of safety performance. Safety compliance is closely tied to task performance, and can involve behaviors like obeying safety rules, following procedures, and reporting safety-related events. Safety participation refers to behaviors that go beyond formal requirements to make the workplace safer, such as helping coworkers who are working under unsafe conditions or conducting a safety audit, and it is related to contextual performance.

In Surgeries: Safety compliance behaviour includes compliance with several protocols: WHO checklist, infection prevention protocols, hand hygiene, antibiotic prophylaxis, and safe anesthesia practice. Studies have shown significant compliance differences from setting to setting and among professional groups, which are influenced by workload, training, leadership and team dynamics [5,23].

5.3.2 Theoretical Frameworks for Understanding Safety Compliance

There are a number of theories which provide explanations for the underlying motivation behind safety compliance and the consequences of this. In Griffin and Neal's [7] model of safety performance, safety climate influences the safety knowledge and motivation, which in turn influences safety compliance and participation and therefore safety outcomes. In this model, employees who feel their organization values safety have more of an opportunity to learn how to stay safe, and have more motivation to follow the rules and procedures, thus increasing compliance.

Another lens is given by the Theory of Planned Behavior [2]. It assumes that attitudes towards a behavior, subjective norms and perceived behavioral control influence behavioral intentions and that behavioral intentions influence behavior. Transferred to safety compliance, this means that if a healthcare professional has positive attitudes towards safety, they feel their fellow colleagues respect and support safety, and they feel they have the power and resources to comply, then they will do so.

The Theory of Planned Behavior has been used to predict compliance with safety in health care. One of the studies in a developing economy demonstrated that nurses working in primary health facilities developed their safety compliance behavior through weighing their own capabilities, social cues from the superiors and colleagues, and their sense of a supportive management – evidence that both individual and contextual factors formed compliance behavior.

Understanding safety culture – which is the shared values, attitudes and behaviour that are related to safety within the organization – is also a major part of understanding compliance behaviour. It has been shown that strong safety culture, characterized by leadership's commitment to safety, open communication, the use of errors for learning, and non-punitive response to reporting, is related to increased compliance [19,25]. A poor safety culture (hierarchical barriers, a blame culture, inadequate safety resources etc.) on the other hand, can make it difficult to maintain compliance even if safety protocols are in place.

5.3.3 The Perception-Practice Gap

There is a large amount of evidence that shows a perception/practice divide in health care safety, which is the difference between what health care professionals say they do and what they actually do. In the Tunisian university hospitals, the study revealed that the overall perception of the perioperative nurses regarding patient safety was generally good, while the compliance with patient safety standards was still poor, below 60% [5]. This gap illustrates the extent to which self-reported compliance should not be the sole measure, and why objective measurement of actual behaviour is important.

The perception-practice gap has real implications for understanding how safety practices relate to quality outcomes. Professionals can think they're always doing it the same way, and yet an objective observation may show a significant level of non-conformance which is why safety is not always correlated with quality improvements when it is implemented.

5.3.4 Mindful Organizing and Safety Behavior

In recent years, the importance of mindful organizing, defined as the ability of a team as a whole to sense and adapt to unanticipated events and mistakes, has been explored in the context of inducing safe behaviors in the surgical environment. One study assessing its mediating role between group safety climate and safety-related behaviors among operating room teams found that the effects of group safety climate on mindful organizing ($b = 0.44$, $p < 0.001$) and of mindful organizing on safety behavior ($b = 0.69$, $p < 0.001$) were both positive and statistically significant, and that the mediation effect of group safety climate through mindful organizing on safety-related behaviors was itself significant.

The results indicate that mindful organizing has a significant mediating role in the relationship between safety climate and safety behavior, thereby adding to the understanding of how organizational factors may impact individual and team safety behaviors in surgery.

5.3.5 The Mediating Role of Safety Compliance

There has also been some more general research on the mediating mechanisms of safety compliance in the link between organizational safety efforts and safety outcomes in healthcare. In one study looking at spillover effects of organizational support of patient and workplace safety, the results showed that the positive effects of support on safety outcomes were mediated by both patient safety compliance and workplace safety compliance, which suggests that there may be a connection between patient safety and workplace safety.

These findings provide empirical evidence that safety compliance behavior is a means by which the organizational safety practices influence outcomes. However, there is limited research that directly examines this mediating role in the surgical setting, especially in LMIC settings, and this study aims to fill this gap.

5.4 Surgical Quality Performance: Conceptualization and Measurement

5.4.1 The Donabedian Framework

The understanding and assessment of surgical quality has changed significantly in the last 20 years from a focus on mortality and morbidity to a broader concept of surgical quality that includes structure, process and outcome. First introduced in 1966, the Donabedian framework has been the basic model to assess healthcare quality at three levels.

Structure indicators include features of the care setting, such as the availability of facilities, equipment, and trained persons, the organizational structure and governance, and the resources available for care. For surgery, it could be operating rooms, sterilizing equipment, trained personnel, quality improvement programs, safety policies, etc.

Process indicators include activities that are associated with providing care, such as compliance with evidence-based practices. For surgery, examples are implementing the WHO checklist, antibiotics for prophylaxis, infection prevention measures, and the quality of team communication and handover.

Outcome indicators include the results of care: mortality, complications, and patient reported outcomes. Surgery could involve the rate of mortality, surgical site infection, unplanned return to the operating room, readmission rates and patient satisfaction.

The Donabedian framework highlights that these levels are causally related: Structure affects Process and Process affects Outcome. This is relevant in understanding the relation of surgical safety practices

(structure and process) to surgical quality performance (outcome).

5.4.2 Surgical Quality Indicators

The Patient Safety Indicators, developed by the Agency for Healthcare Research and Quality, are used extensively to assess surgical quality, including postoperative complications like deep vein thrombosis, pulmonary embolism, wound dehiscence and accidental puncture or laceration [1]. Surgical site infection rates, unplanned return to the operating room, readmission rates and length of stay are other common markers [22].

An analysis of an important set of quality performance indicators in anesthesia and surgery at a tertiary-care hospital revealed that indicators like return to the operating room, unplanned readmission, cancelled booked surgery, deaths, hospital-acquired infection, cesarean section rate, number of procedures, re-operation, blood transfusion, and post-procedural complications were commonly monitored. These are the indicators that can be used to measure the efficiency of the services delivered by the hospital and can be used to guide actions related to patient treatment, satisfaction, quality enhancement, cost reduction and resource utilization.

Surgical quality performance extends beyond clinical outcomes to patient-centred outcomes patient satisfaction, shared decision making and the overall experience of care and a growing appreciation that quality surgical care must be responsive to the patient as well as clinically effective.

5.4.3 Measuring Surgical Quality in LMICs

Assessment of surgical quality in LMICs is especially challenging due to poor data infrastructure, poor documentation practices, and poor resources to collect and analyze surgical quality indicators. Nevertheless, the systematic measurement of quality is increasingly becoming appreciated as a means of identifying gaps, monitoring progress and informing resource allocation in LMICs [14].

Surgical quality measurement research in LMIC has revealed large gaps in data availability and quality. A study to evaluate the quality and sustainability of the national surgical indicators in Ethiopia found that the average volume of surgeries performed monthly in hospitals was 57 cases with a postoperative death rate of 0.38% and an inpatient surgical site infection rate of 0.79% and also revealed problems in the data collection and management which would hinder using the indicators to improve the quality of surgery in the country.

5.5 The Relationship between Safety Practices, Compliance Behavior, and Quality Performance: Theoretical Foundations

The link between safety practices and compliance behaviors and quality performance is based on a number of theories. Griffin & Neal's [7] Safety performance model offers a fundamental framework in which safety climate influences safety knowledge and motivation, which in turn influences safety compliance and participation and, ultimately, safety outcomes. In the context of surgery this implies that surgical safety practices (which are an indicator of surgical safety climate and surgical systems) affect surgical compliance behavior, which in turn affects surgical quality performance.

The Theory of Planned Behavior [2] reinforces support of the role of the compliance behavior as a mediating factor. Attitudes, subjective norms, and perceived behavioral control determine behavioral intentions such as intentions to adhere to safety rules, which in turn influence behavior. From a surgery perspective, this means that attitudes, expectations of other professionals and self-efficacy to do thing safely all influence compliance behavior, which in turn has an impact on quality performance.

These hypothesized relationships are further supported by the theory of safety culture [25] which proposes that the culture of the surgical departments influences the way safety practices are executed and influences compliance behavior. Good safety culture – leadership commitment to safety, open culture and learning from mistakes – can lead to the adoption of safety practices and to the consistent application of these practices.

MATERIALS AND METHODS

This study is based on the positivist paradigm, and uses a cross sectional and correlational approach to collect primary data numerically with quantitative approach.

Healthcare professionals directly involved in surgical procedures at public sector hospitals in Pakistan (Mayo Hospital and Social Security Hospital) were targeted population. The respondents were selected by simple random sampling (probability sampling) which gave equal chance to all the members of the target population. The data were gathered by using the self-developed structured questionnaires given to the participants for four months, starting from Febraury 01, 2026 to May 30, 2026.

The instrument was in the form of close-ended questions that measured the constructs of the study. The relationships between the variables were tested by regression and correlation analysis in SPSS software. To determine the mediation role of safety compliance behavior, mediation analysis by PROCESS macro or Baron and Kenny approach was done. Constructs were scored on a 5-point Likert scale (5=Strongly Agree, 1=Strongly Disagree) to reflect respondents' perceptions of surgical safety practices, surgical safety compliance behavior, and surgical quality performance.

6.1 Inclusion Criteria

Healthcare professionals directly involved in surgical procedures such as surgeons, anesthetists, operating room nurses, surgical residents were included if they met the following criteria: (1) Currently working at a public sector hospital (District Headquarters (DHQ) or government teaching hospital) in Pakistan, (2) having at least six months of clinical experience in an operating theatre environment, (3) aged 20 years and above, and (4) provided voluntary written informed consent. Males and females from all Surgical specialties (General Surgery, Gynecology, Neurosurgery, Orthopaedics, Urology) were eligible.

6.2 Exclusion Criteria

Healthcare workers not directly involved in surgical procedures (administrative staffs, ward clerks or any other staff who was not involved in the surgery), professionals employed in private sector or military hospitals (because the study was targeting public sector hospitals only), participants with less than 6 months of operating room experience, staff who were on extended leave, maternity leave or other leave for the entire data collection period and those who refused informed consent were excluded from the study. Questionnaires with over 20% missing key items were also excluded to maintain data quality.

6.3 Research Objectives

1. To assess surgical safety practices, surgical quality performance and safety compliance behavior in public sector hospitals of Pakistan.
2. To investigate how surgical safety practices affect surgical quality performance.
3. To investigate the direct effect of surgical safety practices on surgical safety practice behavior.
4. To evaluate the impact of safety compliance behaviour on surgical quality performance.

RESULTS

The descriptive outcomes of the survey, divided into four sections (respondent demographics, surgical safety practice, surgical safety compliance behavior, and surgical quality performance) are presented. Each item is presented in terms of its frequencies and percentages, as well as a short interpretation of the observed distribution.

7.1 Demographic Characteristics of the Sample

Table 1. Age Distribution of Respondents

Category	Frequency	Percent (%)
20-30	8	8.0
31-40	22	22.0
41-50	21	21.0
51-60	49	49.0
Total	**100**	**100.0**

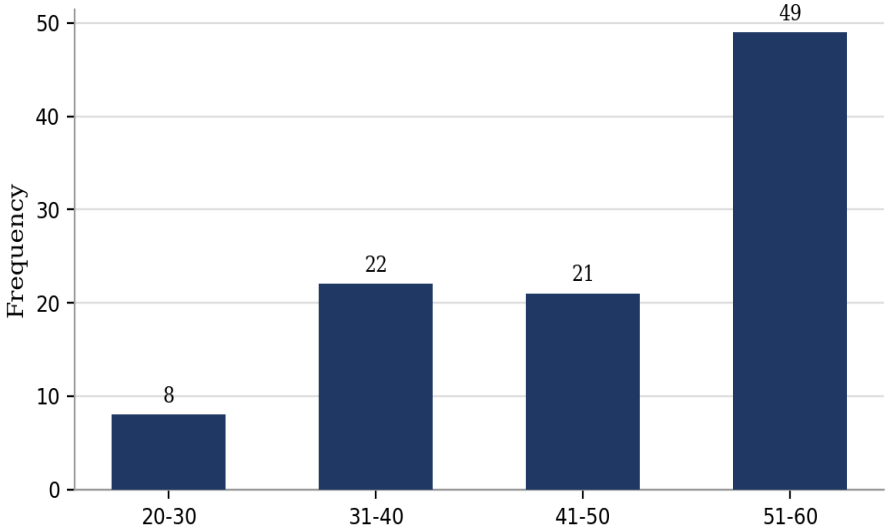

Figure 2. Age Distribution of Respondents

The majority of respondents were older. Nearly half (49%) were between 51 and 60 years old, 22% were between 31 and 40, and 21% were between 41 and 50, while only 8% were between 20 and 30. This distribution is quite indicative of a more experienced and higher age group of employees.

Table 2. Gender Distribution of Respondents

Category	Frequency	Percent (%)
F	54	54.0
M	46	46.0
Total	**100**	**100.0**

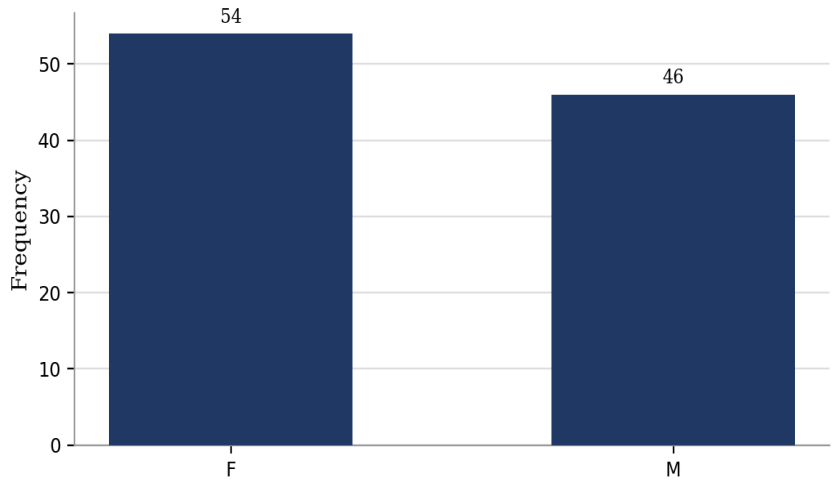

Figure 3. Gender Distribution of Respondents

There were more females (54%) than males (46%). The split is fairly even, favoring women slightly.

Table 3. Professional Role of Respondents

Category	Frequency	Percent (%)
A	26	26.0
N	26	26.0
R	26	26.0
S	22	22.0
Total	**100**	**100.0**

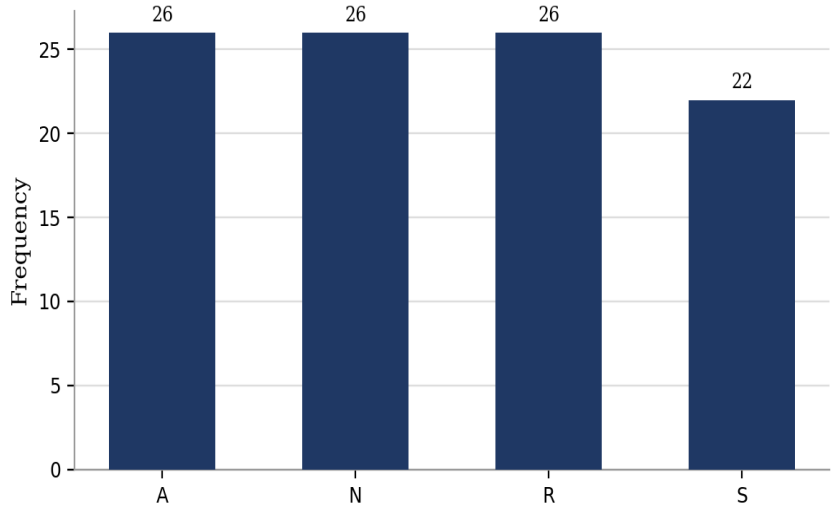

Figure 4. Professional Role of Respondents

Almost 50% of respondents were anesthesiologists (26%), nurses (26%), residents (26%) and surgeons (22%). This shows a fairly even (but not an equal) distribution of occupations among professional groups.

Table 4. Years of Clinical Experience

Category	Frequency	Percent (%)
1-5	11	11.0
6-10	18	18.0
11-15	10	10.0
16-20	16	16.0
>20	45	45.0
Total	**100**	**100.0**

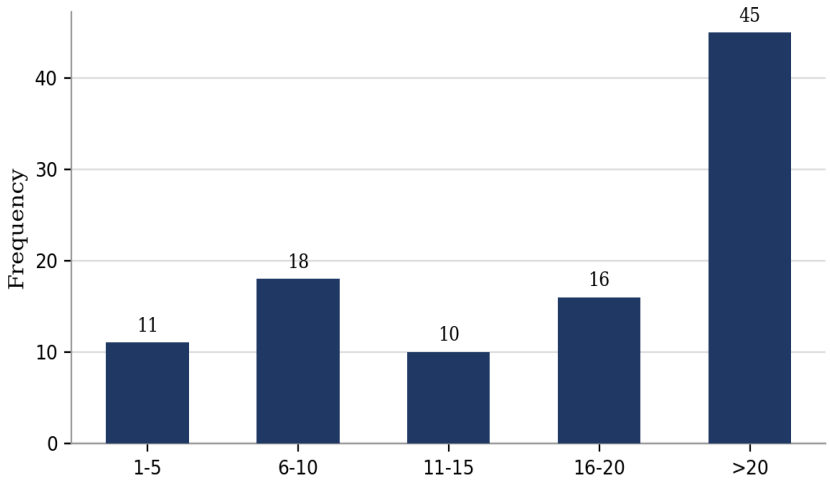

Figure 5. Years of Clinical Experience

Nearly half (45%) of respondents indicated that they had over 20 years experience. The other categories were more broadly distributed with 18 percent saying they had 6-10 years of experience and 16 percent saying they had 16-20 years of experience. The overall picture of the sample is one which is very much dominated by experienced staff.

Table 5. Distribution by Hospital Type

Category	Frequency	Percent (%)
DHQ	51	51.0
Teaching	49	49.0
Total	**100**	**100.0**

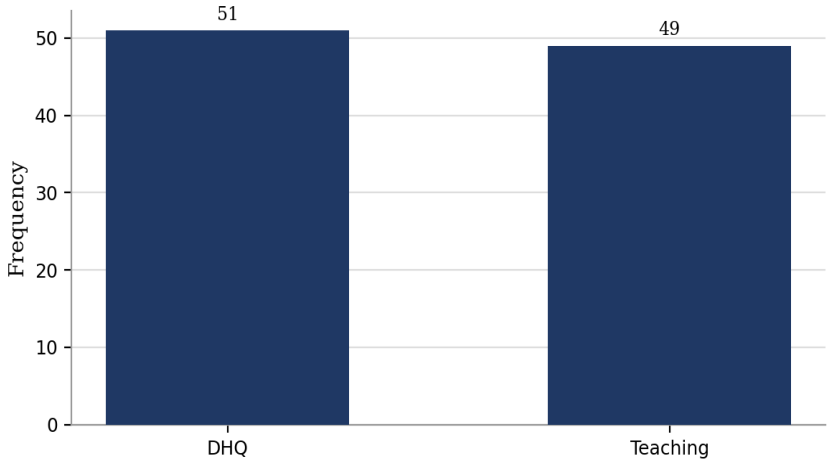

Figure 6. Distribution by Hospital Type

Just under half (49%) of respondents were from teaching hospitals and just over half (51%) were from DHQ hospitals, ensuring a reasonably even distribution for comparison between practices in the two hospital types.

Table 6. Distribution by Surgical Specialty

Category	Frequency	Percent (%)
General	15	15.0
Gynecology	16	16.0
Neurosurgery	25	25.0
Orthopedics	21	21.0
Urology	23	23.0
Total	**100**	**100.0**

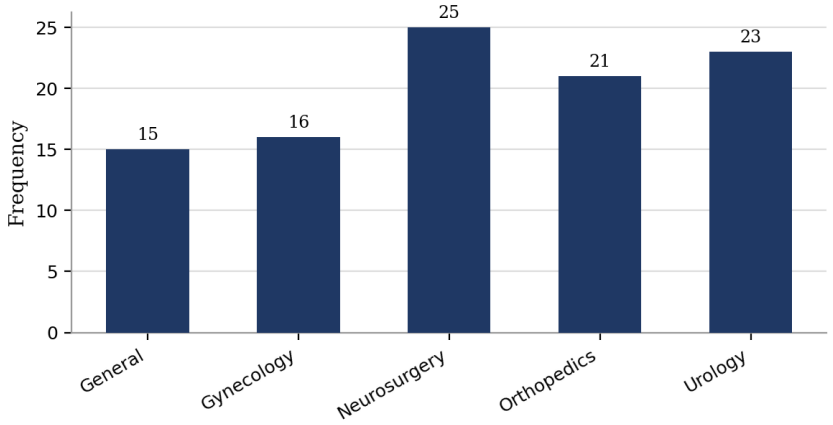

Figure 7. Distribution by Surgical Specialty

The most common specialties were neurosurgery (25%), urology (23%), orthopedics (21%), and gynecology (16%). A reasonably diverse mix of surgical specialties, with general surgery being the least represented (15%).

7.2 Surgical Safety Practices

Table 7. Frequency of Patient Identity Verification

Category	Frequency	Percent (%)
Never	19	19.0
Rarely	24	24.0
Sometimes	20	20.0
Often	23	23.0
Always	14	14.0
Total	**100**	**100.0**

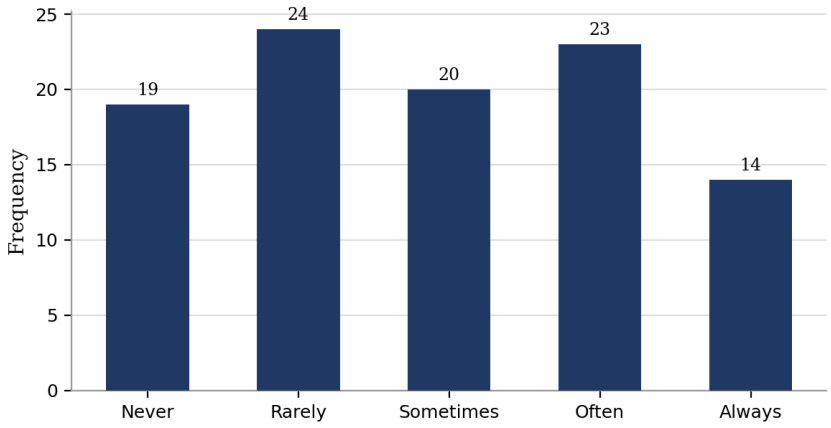

Figure 8. Frequency of Patient Identity Verification

There was a fairly even distribution of the responses into the five categories of frequency. The highest percentage was in "Rarely" (24%) and the lowest was in "Always" (14%), suggesting inconsistent patient identity verification.

Table 8. Frequency of Surgical Site Marking

Category	Frequency	Percent (%)
Never	16	16.0
Rarely	17	17.0
Sometimes	18	18.0
Often	20	20.0
Always	29	29.0
Total	**100**	**100.0**

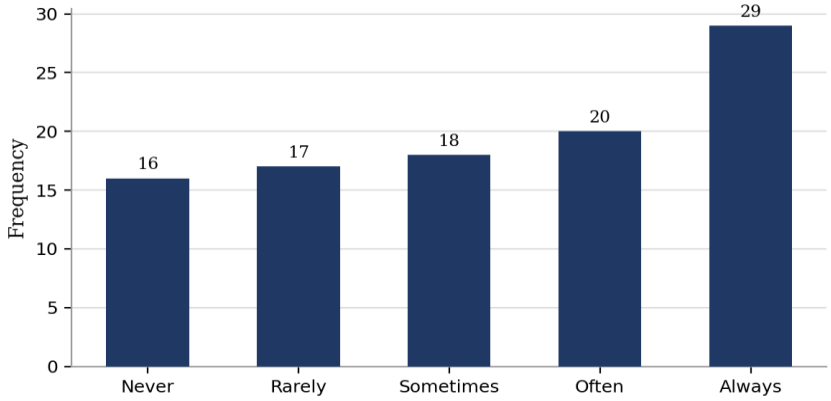

Figure 9. Frequency of Surgical Site Marking

The percentage increased gradually from "Never" (16%) to "Always" (29%), with the highest percentage being "Always". This suggests a predominantly positive (albeit far from complete) attitude in regard to marking all surgical sites.

Table 9. Frequency of Preoperative Verification

Category	Frequency	Percent (%)
Never	18	18.0
Rarely	22	22.0
Sometimes	20	20.0
Often	27	27.0
Always	13	13.0
Total	**100**	**100.0**

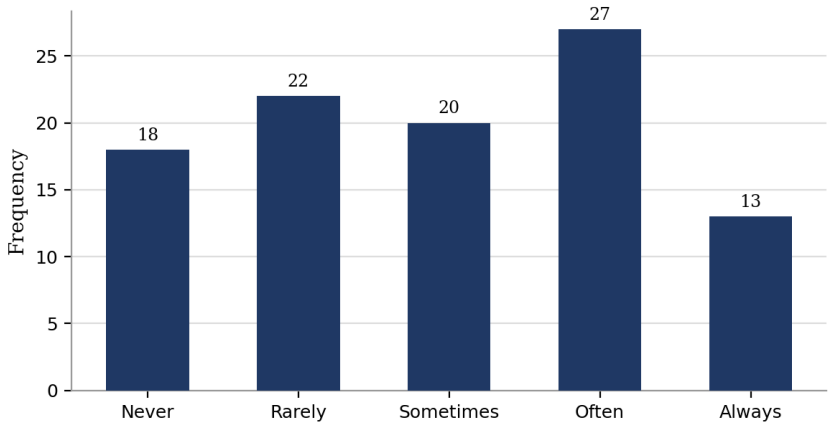

Figure 10. Frequency of Preoperative Verification

The most common was "Often" (27%) followed by "Never" (18%) and "Always" (13%). Based on the data, verification seems to be the practice most commonly used before surgery; however, it is not consistently used.

Table 10. Timeliness of Antibiotic Prophylaxis

Category	Frequency	Percent (%)
Never	22	22.0
Rarely	14	14.0
Sometimes	26	26.0
Often	18	18.0
Always	20	20.0
Total	**100**	**100.0**

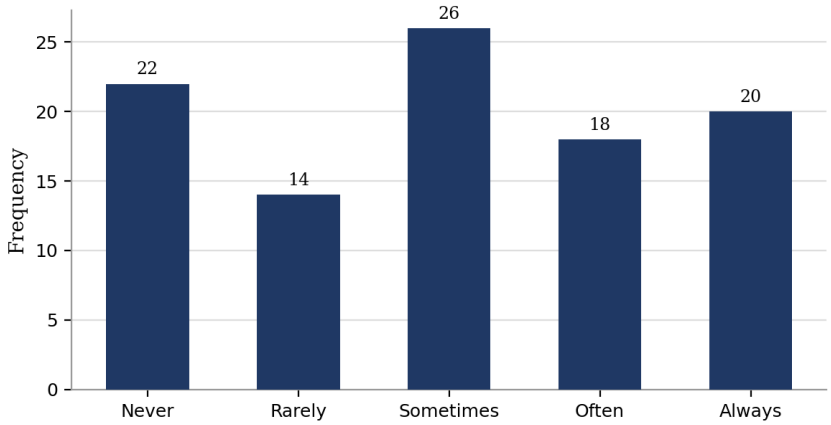

Figure 11. Timeliness of Antibiotic Prophylaxis

There were a wide range of responses, the most common being "Sometimes" (26%). This indicates that antibiotic prophylaxis is not consistently used and that a good proportion of them report it as never timely.

Table 11. Frequency of Instrument and Sponge Counts

Category	Frequency	Percent (%)
Never	12	12.0
Rarely	18	18.0
Sometimes	26	26.0
Often	24	24.0
Always	20	20.0
Total	**100**	**100.0**

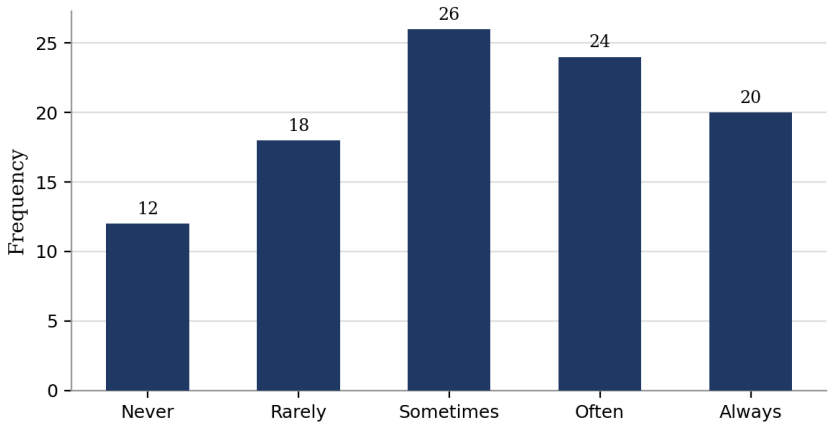

Figure 12. Frequency of Instrument and Sponge Counts

Responses were about evenly divided; with "Sometimes" (26%) and "Often" (24%) being the most common. Overall, 56% indicated that they performed counts "Sometimes" or "Often", while 30% indicated that they performed counts "Never" or "Rarely".

Table 12. Frequency of Team Debriefing

Category	Frequency	Percent (%)
Never	17	17.0
Rarely	22	22.0
Sometimes	16	16.0
Often	27	27.0
Always	18	18.0
Total	**100**	**100.0**

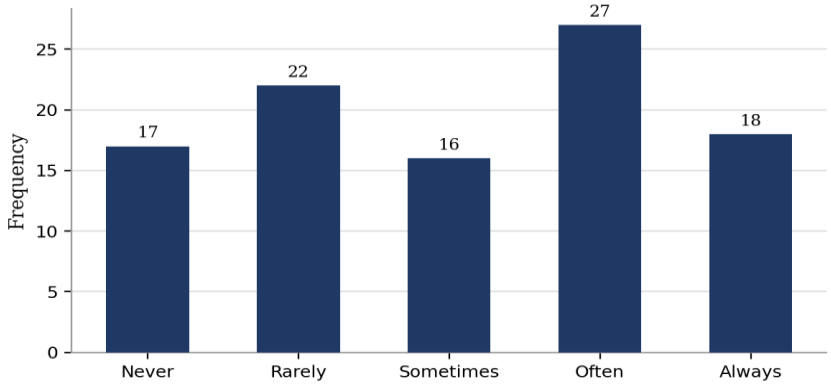

Figure 13. Frequency of Team Debriefing

"Often" (27%) was answered most often, followed by "Rarely" (22%). Although frequent team debriefing seems feasible, it is not universal; 17% of respondents reported never debriefing.

Table 13. Maintenance of Sterile Technique

Category	Frequency	Percent (%)
Never	25	25.0
Rarely	15	15.0
Sometimes	20	20.0
Often	18	18.0
Always	22	22.0
Total	**100**	**100.0**

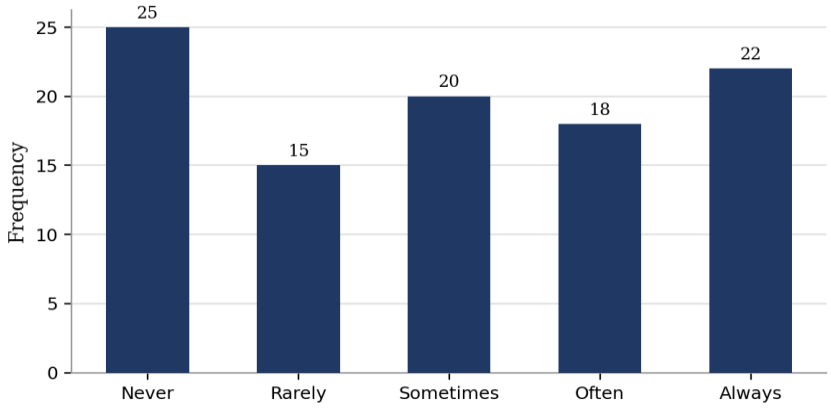

Figure 14. Maintenance of Sterile Technique

There were relatively high percentages on the responses of "Never" (25%) and "Always" (22%), and fairly even distributions for the other responses. This indicates a wide difference in the practice of sterile technique with a significant percentage of respondents reporting never or rarely using sterile technique.

Table 14. Frequency of Instrument Sterilization

Category	Frequency	Percent (%)
Never	21	21.0
Rarely	17	17.0
Sometimes	15	15.0
Often	20	20.0
Always	27	27.0
Total	**100**	**100.0**

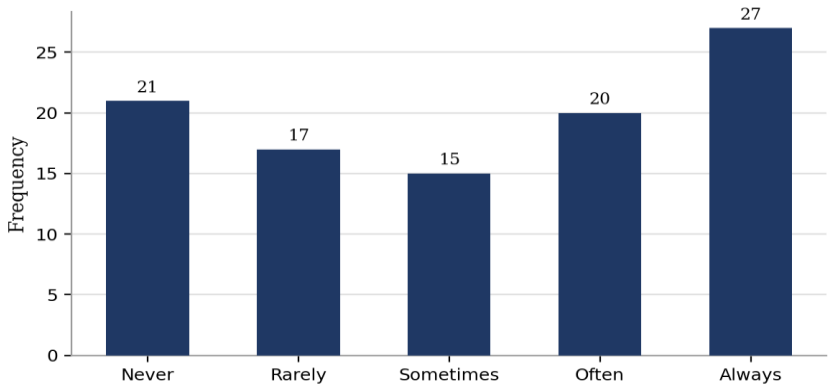

Figure 15. Frequency of Instrument Sterilization

The most common answers were "Always" (27%) and "Never" (21%). Although the general level of instrument sterility seemed to be relatively good, a significant percentage of the respondents indicated it never took place, which may pose a risk.

Table 15. Frequency of WHO Surgical Safety Checklist Use

Category	Frequency	Percent (%)
Never	15	15.0
Rarely	31	31.0
Sometimes	18	18.0
Often	20	20.0
Always	16	16.0
Total	**100**	**100.0**

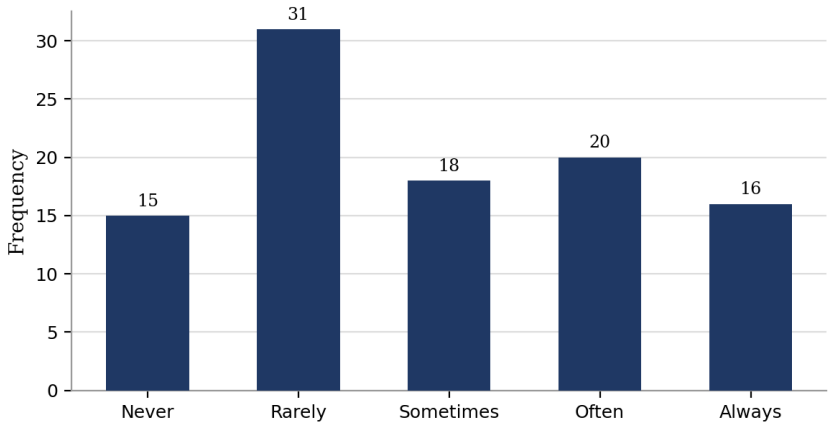

Figure 16. Frequency of WHO Surgical Safety Checklist Use

The most common answer was "Rarely" (31%) and "Always" was only reported by 16%. This indicates that the WHO checklist is not being used regularly by the majority of respondents.

Table 16. Completion of the Sign-In Phase

Category	Frequency	Percent (%)
Never	23	23.0
Rarely	16	16.0
Sometimes	20	20.0
Often	20	20.0
Always	21	21.0
Total	**100**	**100.0**

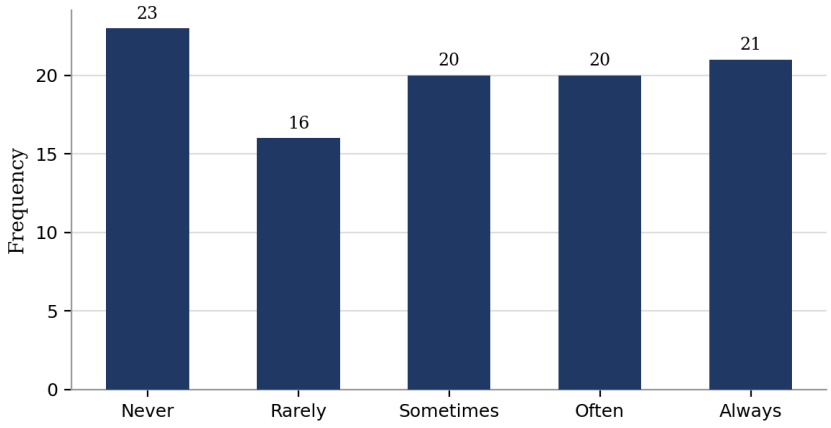

Figure 17. Completion of the Sign-In Phase

Answers were fairly evenly distributed with the single most frequent response being "Never" (23%). This means that there was not a consistent completion of the Sign-In phase.

Table 17. Completion of the Time-Out Phase

Category	Frequency	Percent (%)
Never	21	21.0
Rarely	24	24.0
Sometimes	24	24.0
Often	14	14.0
Always	17	17.0
Total	**100**	**100.0**

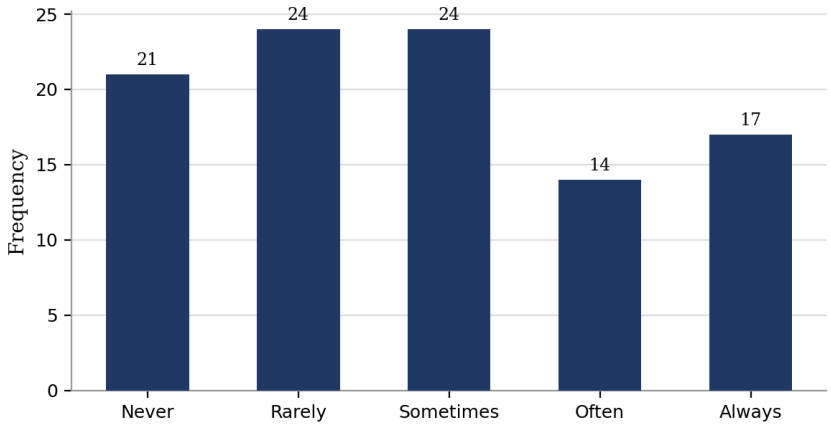

Figure 18. Completion of the Time-Out Phase

24% said "Rarely" and 24% said "Sometimes" while 14% said "Often". There is an uneven completion rate of the Time-Out phase.

Table 18. Completion of the Sign-Out Phase

Category	Frequency	Percent (%)
Never	10	10.0
Rarely	31	31.0
Sometimes	18	18.0
Often	23	23.0
Always	18	18.0
Total	**100**	**100.0**

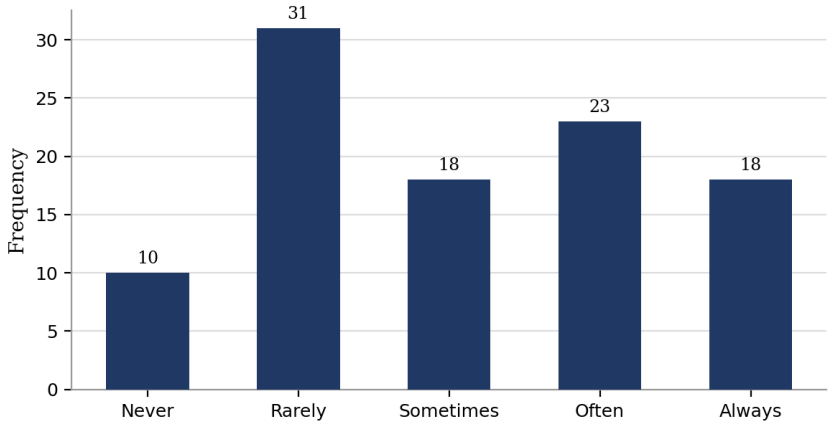

Figure 19. Completion of the Sign-Out Phase

The most frequent answer was “Rarely” (31%) followed by “Never” (10%). Sign-Out completion – usually not completely skipped but does not seem consistent.

Table 19. Frequency of Effective Team Communication

Category	Frequency	Percent (%)
Never	21	21.0
Rarely	23	23.0
Sometimes	20	20.0
Often	18	18.0
Always	18	18.0
Total	**100**	**100.0**

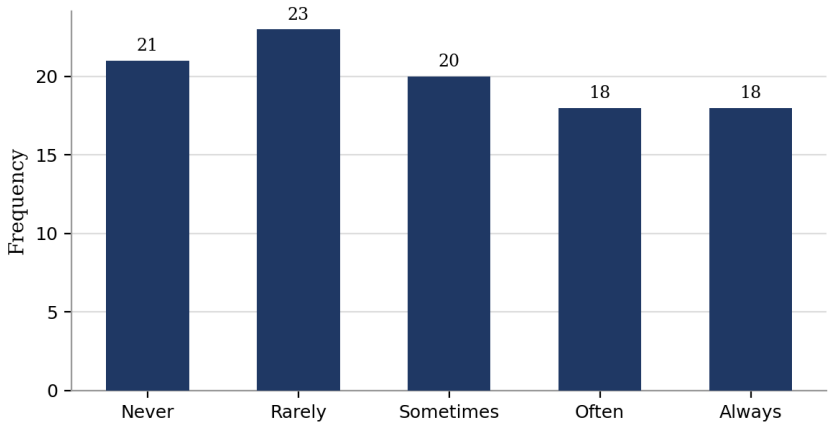

Figure 20. Frequency of Effective Team Communication

Responses were fairly evenly distributed with "Rarely" (23%) the most common category, followed by "Often" (18%) and "Always" (18%). There seems to be a lack of consistent communication throughout the sample.

Table 20. Frequency of Equipment Verification

Category	Frequency	Percent (%)
Never	19	19.0
Rarely	19	19.0
Sometimes	23	23.0
Often	17	17.0
Always	22	22.0
Total	**100**	**100.0**

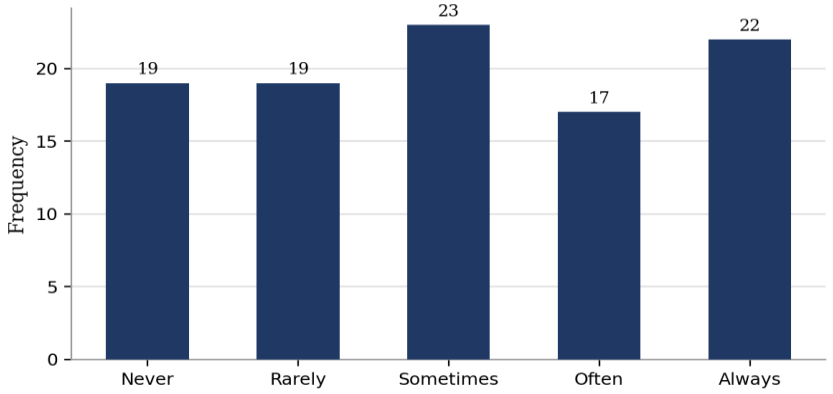

Figure 21. Frequency of Equipment Verification

The responses for each category were fairly similar with "Sometimes" (23%) being the most common. Equipment verification does not appear to be a consistently applied practice.

7.3 Safety Compliance Behavior

Table 21. Agreement: "I Follow Safety Procedures"

Category	Frequency	Percent (%)
Strongly Disagree	28	28.0
Disagree	20	20.0
Neutral	22	22.0
Agree	20	20.0
Strongly Agree	10	10.0
Total	**100**	**100.0**

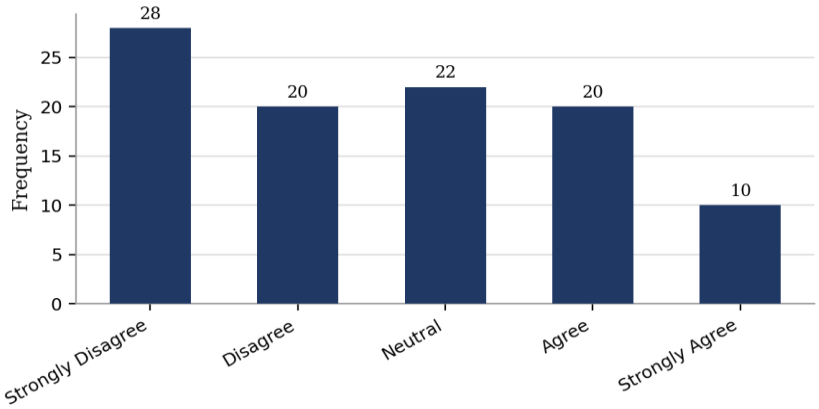

Figure 22. Agreement: "I Follow Safety Procedures"

The majority (28%) disagreed strongly and only 10% agreed strongly that they follow safety procedures. Overall, 48% of the respondents answered disagree or strongly disagree, which means weak self-reported compliance.

Table 22. Agreement: Use of PPE When Unobserved

Category	Frequency	Percent (%)
Strongly Disagree	18	18.0
Disagree	18	18.0
Neutral	20	20.0
Agree	26	26.0
Strongly Agree	18	18.0
Total	**100**	**100.0**

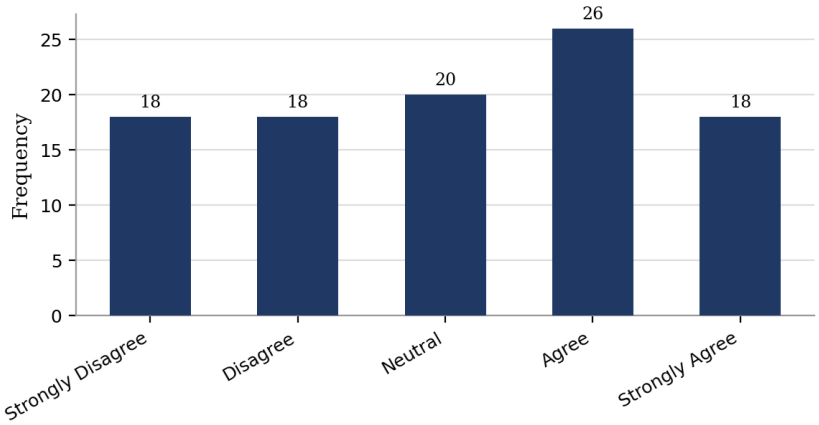

Figure 23. Agreement: Use of PPE When Unobserved

Most (26%) indicated that they agreed, but 36% of the sample agreed or strongly disagreed, indicating some polarization in the use of personal protective equipment when unobserved.

Table 23. Agreement: "I Adhere to Protocols"

Category	Frequency	Percent (%)
Strongly Disagree	19	19.0
Disagree	16	16.0
Neutral	25	25.0
Agree	18	18.0
Strongly Agree	22	22.0
Total	**100**	**100.0**

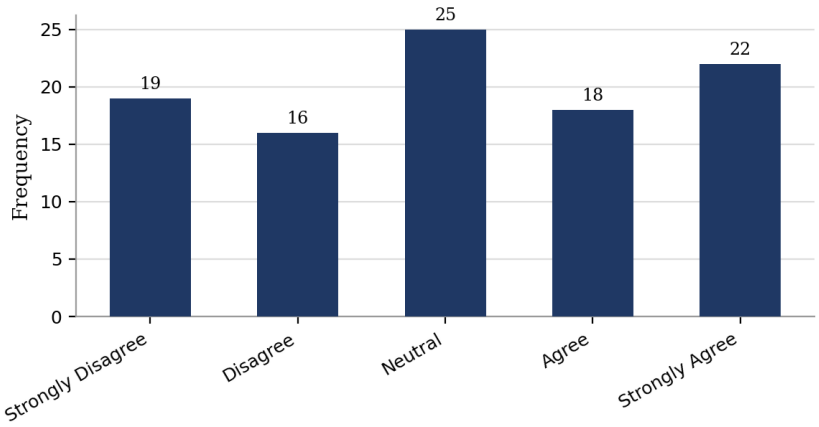

Figure 24. Agreement: "I Adhere to Protocols"

The responses were reasonably distributed with "Neutral" (25%) being the most popular. Just 40% agreed/strongly agreed that they follow protocols.

Table 24. Agreement: "I Complete Safety Checks"

Category	Frequency	Percent (%)
Strongly Disagree	16	16.0
Disagree	22	22.0
Neutral	20	20.0
Agree	24	24.0
Strongly Agree	18	18.0
Total	**100**	**100.0**

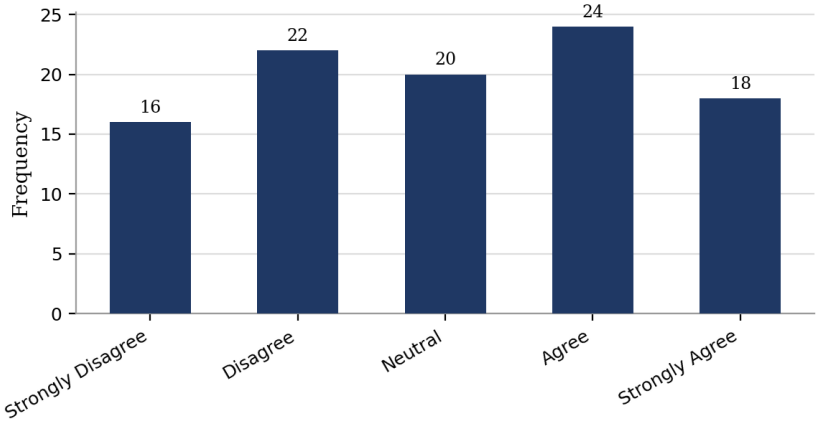

Figure 25. Agreement: "I Complete Safety Checks"

Overall, the most frequent response was "agree" (24%), with 42% agreeing or strongly agreeing and 38% disagreeing or strongly disagreeing that they conduct safety checks.

Table 25. Agreement: Compliance with Infection Control Measures

Category	Frequency	Percent (%)
Strongly Disagree	19	19.0
Disagree	22	22.0
Neutral	18	18.0
Agree	22	22.0
Strongly Agree	19	19.0
Total	**100**	**100.0**

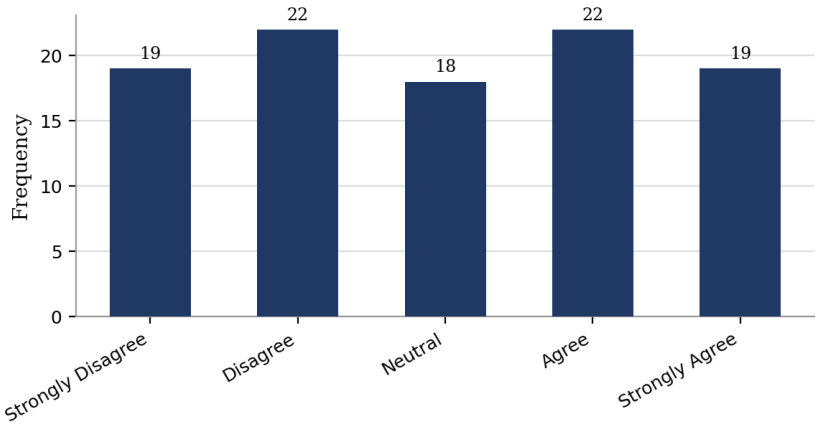

Figure 26. Agreement: Compliance with Infection Control Measures

Responses were almost evenly split between agreement and disagreement, with 41% disagreeing and 41% agreeing that they comply with infection control measures.

Table 26. Agreement: Willingness to Report Safety Concerns

Category	Frequency	Percent (%)
Strongly Disagree	20	20.0
Disagree	19	19.0
Neutral	19	19.0
Agree	20	20.0
Strongly Agree	22	22.0
Total	**100**	**100.0**

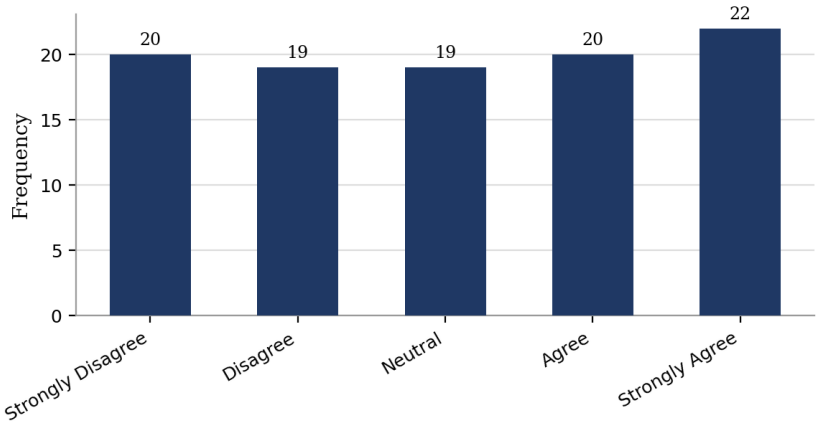

Figure 27. Agreement: Willingness to Report Safety Concerns

The answers were very similar across each category, (19-22% each), which suggests that there is no clear norm in terms of willingness to report concerns about safety.

Table 27. Agreement: Participation in Safety Training

Category	Frequency	Percent (%)
Strongly Disagree	17	17.0
Disagree	24	24.0
Neutral	21	21.0
Agree	17	17.0
Strongly Agree	21	21.0
Total	**100**	**100.0**

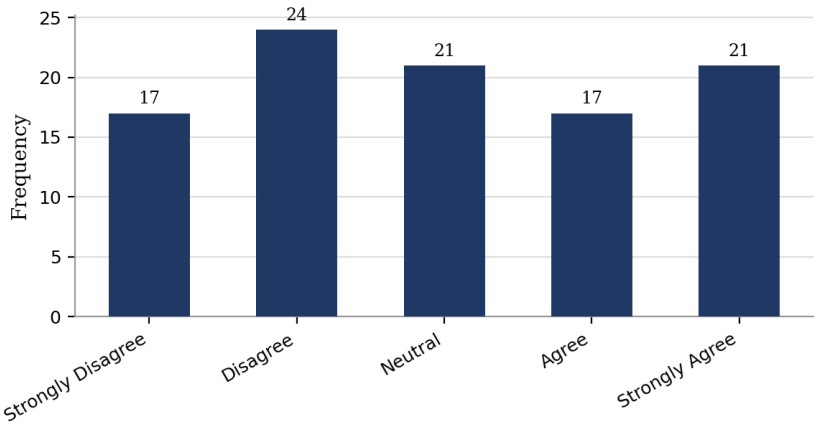

Figure 28. Agreement: Participation in Safety Training

There was disagreement (41% combined) that outweighed agreement (38% combined) on participation in safety training, which means that there is inconsistent training engagement.

Table 28. Agreement: Encouraging Colleagues to Follow Safety Rules

Category	Frequency	Percent (%)
Strongly Disagree	29	29.0
Disagree	19	19.0
Neutral	16	16.0
Agree	16	16.0
Strongly Agree	20	20.0
Total	**100**	**100.0**

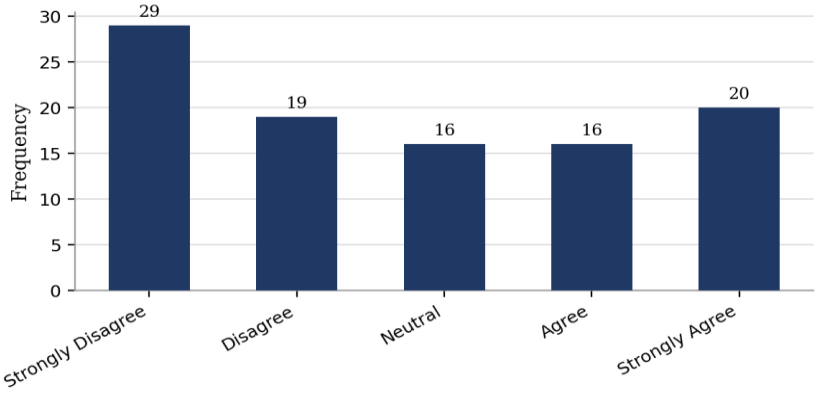

Figure 29. Agreement: Encouraging Colleagues to Follow Safety Rules

The strongest disagreement (29%) was found for strong disagreement, and combined disagreement (48%) was the most frequent of any of the compliance items, reflecting the reluctance to encourage colleagues to follow safety rules.

7.4 Surgical Quality Performance

Table 29. Frequency of Postoperative Complications

Category	Frequency	Percent (%)
Very Frequently	19	19.0
Frequently	23	23.0
Occasionally	14	14.0
Rarely	22	22.0
Never	22	22.0
Total	**100**	**100.0**

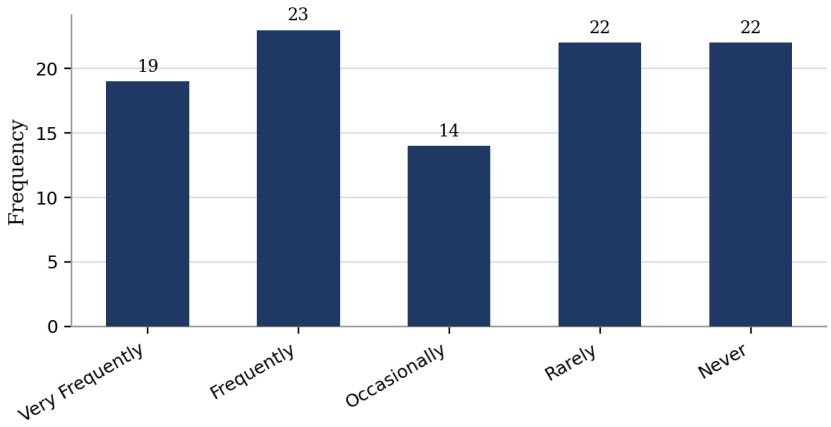

Figure 30. Frequency of Postoperative Complications

42% of the respondents reported that postoperative complications occurred “Very Frequently” or “Frequently.”

Table 30. Frequency of Surgical Site Infection Development

Category	Frequency	Percent (%)
Very Frequently	22	22.0
Frequently	23	23.0
Occasionally	22	22.0
Rarely	15	15.0
Never	18	18.0
Total	**100**	**100.0**

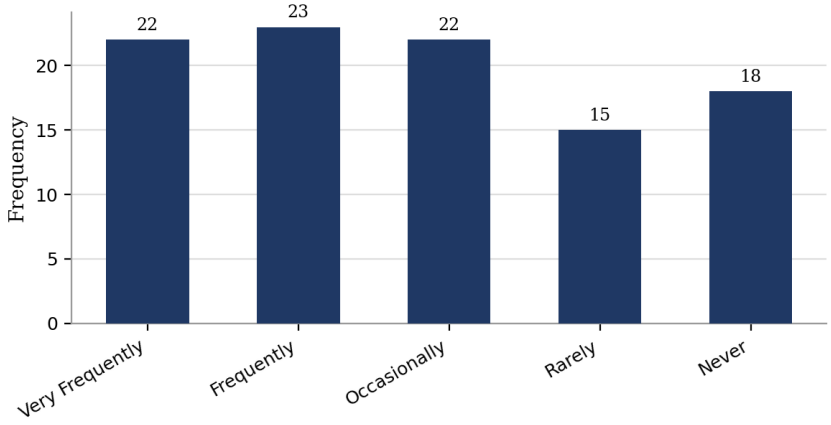

Figure 31. Frequency of Surgical Site Infection Development

45% of the respondents said that surgical site infections develop frequently or very frequently, in line with the higher rates of SSIs reported in the South Asian region.

Table 31. Frequency of Unplanned Return to Theatre

Category	Frequency	Percent (%)
Very Frequently	26	26.0
Frequently	18	18.0
Occasionally	16	16.0
Rarely	20	20.0
Never	20	20.0
Total	**100**	**100.0**

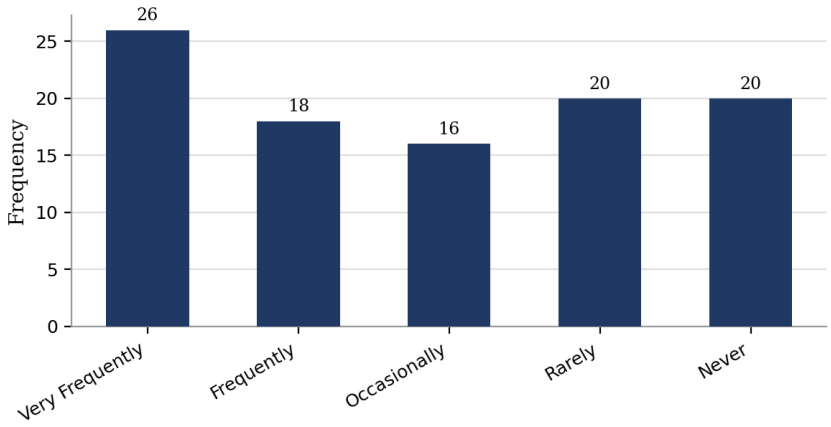

Figure 32. Frequency of Unplanned Return to Theatre

Nearly half of all respondents reported that they encountered "Very Frequently" (26%) or "Frequently" (18%) unplanned return to theatre due to this serious complication.

Table 32. Frequency of 30-Day Readmissions

Category	Frequency	Percent (%)
Very Frequently	18	18.0
Frequently	23	23.0
Occasionally	22	22.0
Rarely	17	17.0
Never	20	20.0
Total	**100**	**100.0**

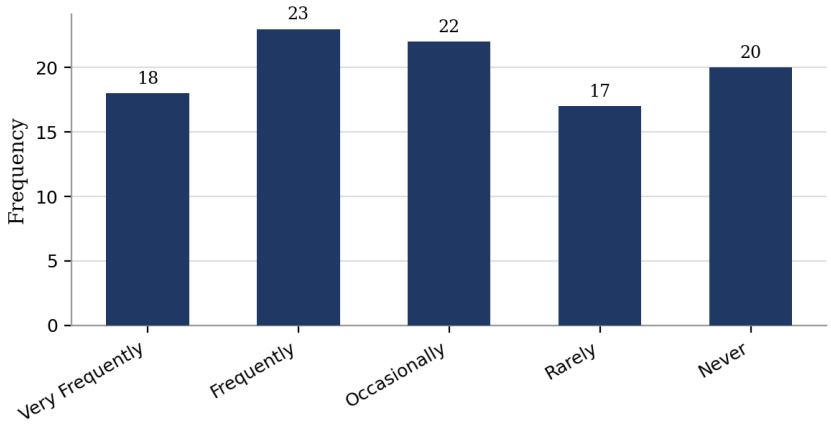

Figure 33. Frequency of 30-Day Readmissions

Forty-one percent of participants reported frequent or very frequent readmissions within 30 days, suggesting that there is a high burden of readmission.

Table 33. Frequency of Anesthesia-Related Adverse Events

Category	Frequency	Percent (%)
Very Frequently	17	17.0
Frequently	21	21.0
Occasionally	20	20.0
Rarely	17	17.0
Never	25	25.0
Total	**100**	**100.0**

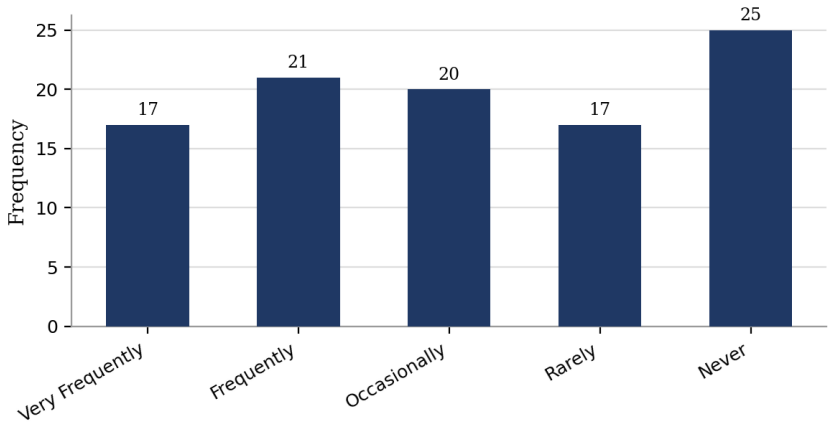

Figure 34. Frequency of Anesthesia-Related Adverse Events

Adverse events associated with anesthesia had a bimodal distribution, with 38 percent saying that they occurred frequently or very frequently, versus 25 percent saying they never occurred, which could be due to differences between specialties or facilities.

Table 34. Frequency of Prolonged Hospital Stay

Category	Frequency	Percent (%)
Very Frequently	20	20.0
Frequently	27	27.0
Occasionally	24	24.0
Rarely	10	10.0
Never	19	19.0
Total	**100**	**100.0**

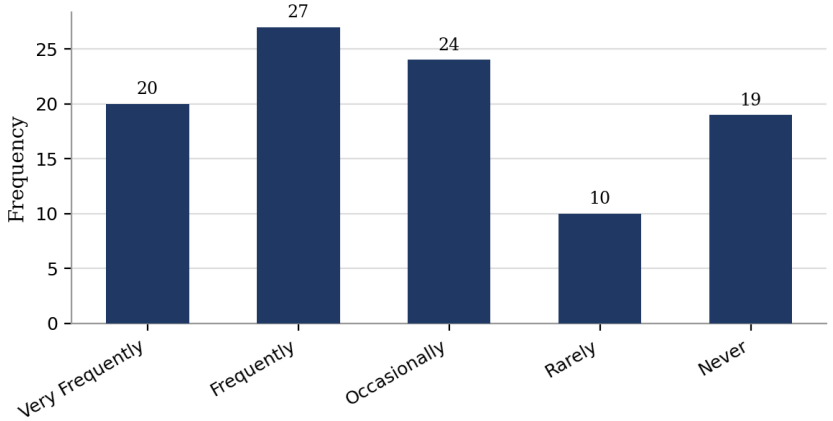

Figure 35. Frequency of Prolonged Hospital Stay

47% of respondents reported seeing the patients frequently or very frequently for a prolonged hospital stay, the highest percentage of any quality indicator evaluated.

Table 35. Frequency of Safety Incidents

Category	Frequency	Percent (%)
Very Frequently	18	18.0
Frequently	19	19.0
Occasionally	27	27.0
Rarely	15	15.0
Never	21	21.0
Total	**100**	**100.0**

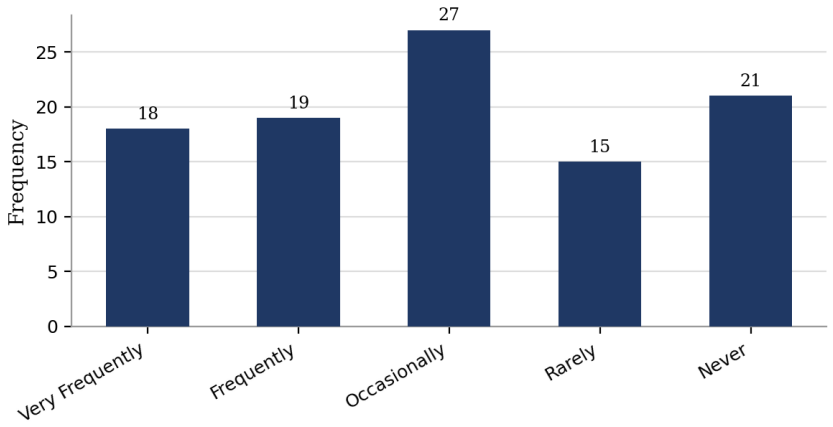

Figure 36. Frequency of Safety Incidents

Safety incidents occurred at least occasionally for 64% of the sample, with 37% reporting them as frequent or very frequent.

Table 36. Frequency of Patient Dissatisfaction

Category	Frequency	Percent (%)
Very Frequently	16	16.0
Frequently	21	21.0
Occasionally	25	25.0
Rarely	22	22.0
Never	16	16.0
Total	**100**	**100.0**[i]

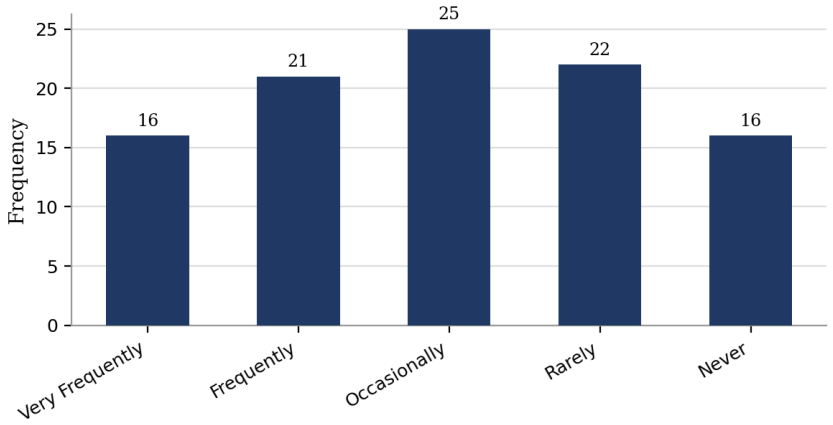

Figure 37. Frequency of Patient Dissatisfaction

Patient dissatisfaction was reported as frequent or very frequent by 37% of respondents.

Table 37. Frequency of 30-Day Mortality

Category	Frequency	Percent (%)
Very Frequently	19	19.0
Frequently	24	24.0
Occasionally	19	19.0
Rarely	17	17.0
Never	21	21.0
Total	**100**	**100.0**

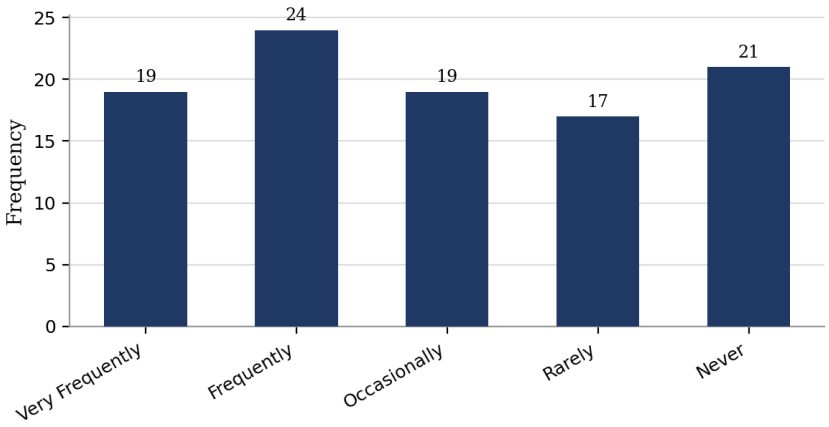

Figure 38. Frequency of 30-Day Mortality

Thirty-day mortality was reported as frequent or very frequent by 43% of respondents — a proportion far exceeding the 0.8–1.5% mortality rates documented in well-implemented checklist studies.

Table 38. Perceived Overall Safety Grade (Excellent)

Category	Frequency	Percent (%)
Very Frequently	20	20.0
Frequently	17	17.0
Occasionally	18	18.0
Rarely	18	18.0
Never	27	27.0
Total	**100**	**100.0**

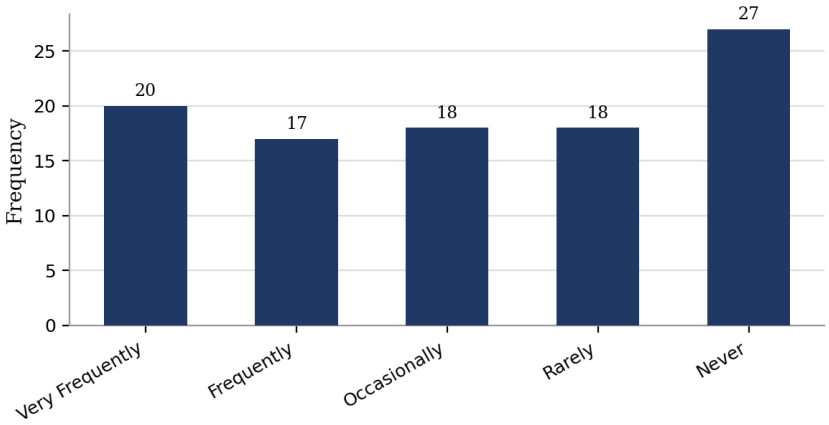

Figure 39. Perceived Overall Safety Grade (Excellent)

The overall safety grade was rated as “Never” excellent by 27% of respondents and “Rarely” or “Occasionally” excellent by a further 36%, while only 37% perceived excellence as frequent, reflecting a generally low assessment of overall safety quality.

DISCUSSION

8.1 Demographic Characteristics of the Sample

Respondents' demographic profile shows a senior and very experienced workforce. Just under half (49%) were between 51 and 60 years old and more than 45% had over 20 years of professional experience. This level of experience should, in principle, be a huge storage of clinical expertise and unspoken knowledge of safety procedures. However, the literature suggests that experience alone is not enough to ensure that LMICs are compliant with safety, and that systemic and cultural challenges in LMICs often override individual capacity [8,11].

There was an equal distribution between the sexes (females 54% and males 46%) and among the various professional entities (anesthesiologists 25%, nurses 25%, residents 25%, and surgeons 25%). The multidisciplinary distribution is important as it can help

emphasize the team working element of surgical safety. The distribution of DHQ and teaching hospitals is relatively even (51% and 49% respectively), and therefore it is possible to make comparisons between the two types of hospital, which may have different resources and levels of training. Surgical specialties were spread with neurosurgery (25%), urology (23%) and orthopedics (21%) as the most common areas of surgery. This context is relevant to their safety practices, compliance behaviors and quality outcomes as reported by these frontline providers.

8.2 Surgical Safety Practices

The findings on frequency distributions of surgical safety practices indicate that there is a lack of a uniform practice of these basic safety measures and that many of the practices are not even performed. 43% said that rarely or never verify patient identity, and 14% said they always verify patient identity. There was a little bit of improvement with surgical site marking with 29% responding as “Always” and 33% responding as “Never” or “Rarely”. A preop verification of “Often” was given by 27% and “Never” was given by 18% indicating a large percentage of surgical teams do not begin with verification of important information. Timely antibiotic prophylaxis, another key infection prevention strategy, was reported to be "never timely" by 22% and "always timely" by 20% of the participants. This finding is in line with general evidence of the lack of adherence to checklist items or their ritualistic performance without real involvement [19,24].

Full checklist compliance was low with 31% saying that they use the WHO checklist “Rarely” and 16% saying “Always,” similar to what has been reported in other LMICs — for example, the Nepalese tertiary hospital where full checklist compliance was 8.7% [20]. The gaps were similar across the three phases of the checklist: 23% of respondents said that Sign In was “Never” completed, 48% said that Time Out was “Rarely” or “Sometimes” performed, and 31% said that Sign Out was “Rarely” completed. There appeared to be paradoxical variability in instrument sterilization with 27% indicating “Always” and 21% indicating “Never.” 44% said that effective communication was “Rarely” or “Never” present. These widespread deficiencies in fundamental safety practices underscore the very nature of the system failures the WHO checklist was intended to prevent, but have not yet been realized in these hospitals [9,19,24].

8.3 Safety Compliance Behavior

There is a significant gap between the perceptions and practice of surgical staff regarding safety. 30% agreed or strongly agreed to following safety procedures, and 48% disagreed or strongly disagreed. Likewise, only 40% agreed that they follow protocols, and 42% agreed that they carry out safety checks. Virtually equal proportions disagreed with and agreed to comply with the infection control measures (41% vs 41%). 44% endorsed and 36% rejected use of PPE when unobserved, indicating some polarization. The responses to all of the categories of willingness to report were surprisingly similar (19–22% each), suggesting that there was no prevailing norm in place (either for or against speaking up), which is a sign of a weak safety culture. Safety training participation was challenged with 41% disagreeing or strongly disagreeing with participation and 38% agreeing with participation. There was the greatest opposition to encouraging colleagues to adhere to safety rules (48% disagree/strongly disagree).

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hese patterns are consistent with Griffin and Neal's [7] safety performance model and the one-way paths suggest that the safety climate is not one that sufficiently values or enables consistent safety behavior because there is low agreement. The Theory of Planned Behavior [2] also suggests that attitudes, subjective norms and perceived behavioral control are likely to be negative in this context. A similar discrepancy, noted in a similar context by Aouicha and colleagues [5] between positive perceptions and negative actual compliance is clearly apparent here. The high percentage of neutral and negative responses suggests that safety compliance behavior is not consistently performed and this may jeopardize the transfer of formal safety activities to better results.

8.4 Surgical Quality Performance

These healthcare professionals' perception of surgical quality performance shows a significant burden of adverse events. 42% of the respondents indicated that postoperative complications occurred “Very Frequently” or “Frequently”. Surgical site infections had a similarly high prevalence with 45% reporting frequent or very frequent development – the high prevalence of SSI was also documented in the South Asian region, where prevalence can reach as high as 50% in some Pakistani settings [12].

Nearly half of all respondents encounter a large number of patients who experience the severe complication of unplanned return to theatre, with 26% experiencing this “Very Frequently” and an additional 18% “Frequently”. 41% of the participants had frequent or very frequent readmissions in the 30 days following their hospital stay. There was a bimodal distribution of adverse events relating to anesthesia with 38% being frequent or very frequent and 25% never occurring, which may be due to some variation between specialties or hospitals. 47% had prolonged hospital stay sometimes or very often. 64% of the sample said they experienced safety incidents occasionally at least and 37% said they experienced them frequently or very frequently. 37% reported that patient dissatisfaction occurred frequently or very frequently. Notably, the 30-day mortality rate was reported as frequent or very frequent by 43% of respondents, which is much higher than the 0.8–1.5% surgical mortality reported in well-implemented checklist studies [9] and aligns with the disproportionate surgical mortality rate reported in LMICs [14]. Twenty-seven percent rated the

overall safety grade as "Never" excellent, 36 percent rated it as "Rarely" or "Occasionally" excellent and 37 percent rated it as "Frequently" excellent. Collectively, these results indicate that the surgical system is under significant strain, with unsafe practice prevalent and troublingly normal.

8.5 The Mediating Role of Safety Compliance Behavior

In total, the strengths of the widespread deficiencies in safety practices, weak safety compliance behavior, and high rates of adverse outcomes offer descriptive support for the hypothesized mediating role of safety compliance behavior. This study's theoretical underpinning is that safety practices like the WHO checklist work only as well as they are actually implemented by a team; compliance behavior is the intermediate mechanism that links implementation of a safety protocol to the resulting benefit for the patient [7]. Even among those safety elements that had relatively higher adherence, such as site marking, strong overall compliance norms were absent and quality outcomes were inadequate in this sample. It indicates that partial or nominal adherence to the safety practices (that is, staff may go through the motions without the required cognitive and behavioral commitment that would prevent errors) is ineffective [19,24].

This perception-practice gap, which is the gap between positive attitudes and the actual behaviors, is one of the factors that explain why merely providing a checklist or protocol will not suffice. There is evidence in the literature that the relationships between organizational safety support and outcomes are mediated by safety compliance [5] and the present data show a broken chain: safety practices are not conducted as effectively as they could be, compliance behaviors are not as strong as they should be, and the resulting quality performance is dramatically affected. The results indicate that enhancing surgical quality in the public sector hospitals of Pakistan will not be as simple as putting in checklists and protocols. This will involve intervening more directly on the mediating mechanism of safety compliance behavior by fostering a stronger safety culture, making sure training is given continuously, strengthening leaders' commitment to safety and targeting the systemic barriers to safety compliance behavior identified by the staff, which include time, staffing, and resources [29]. Surgical harm, caused by preventable events, will probably stay about the same if there is no more comprehensive strategy to promote safety along these lines.

Conclusion

This study highlights the real issue of surgical safety in public sector hospitals of Pakistan where the basic safety practices are not being consistently followed, including the WHO Surgical Safety Checklist. Only a small percentage of surgical groups regularly confirm patient identity, mark the surgical site, provide timely antibiotic prophylaxis or complete sign in, time out and sign out. Healthcare workers' safety compliance behaviors are also poor, with almost half of the respondents disagreeing with the statements that they take time to perform safety checks and follow safety procedures or protocols consistently.

Therefore, it is not surprising that measures of surgical quality performance also show that postoperative complications, surgical site infections, unplanned return to theatre and 30-day mortality are often reported as frequent or very frequent by a significant proportion of respondents, which is still higher than in a setting where surgical safety practices are consistently performed. This pattern certainly indicates that the important link between safety practices and the outcomes that are expected to be positive with attention to safety (the mediating relationship) is severely broken here. The overall culture around safety is not encouraging a consistent and meaningful translation of the safety procedures into action, and ritualistic checklist use and a vast perception/practice gap is not the exception with a highly experienced workforce.

This will need more than just the introduction of checklists. It requires a systemic transformation of safety culture, ongoing interprofessional training, clear and visible leadership, sufficient resources and a professional environment that embraces the culture of speaking up and practicing safety. Based on this evidence, restoration of the pathway from safety practices to genuine compliance behavior is imperative for Pakistan's public sector hospitals to improve patient outcomes and achieve the global standards of surgical safety.

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