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Assessment of Knowledge, Attitude, and Practice Regarding Instrument Handling in Intraoperative Environment among Operation Theatre Staff

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ABSTRACT

In the intraoperative setting, proper handling of instruments is essential to maintain surgical efficiency and ensure patient safety. This would heavily rely on the personnel of the operating theatre (OT), such as surgeons, nurses, and technicians. Their knowledge, attitude, and practice (KAP) of working with the instruments could be evaluated, which would help identify the areas that require improvement in the outcomes of the surgery. **Objectives:** To assess the knowledge, attitudes, and practices of the operating theatre personnel related to the management of instruments during the intraoperative care, to find the gaps in the protocol compliance, and to discuss the factors that impact compliance. **Methods:** A descriptive cross-sectional study was conducted among working staff in specific hospitals operating theatres. They came up with a self-administered questionnaire that assessed their knowledge, attitudes, as well as practices in regard to instrument handling. **Results:** This study found that 113 (78%) operating theatre staff had a decent theoretical understanding of how to handle the instruments, and 116 (80%) were aware of their responsibility in preventing surgical site infection. Nevertheless, only 87 (60%) of them were adherent to proper handling protocols. In workload, time constraints, and limited resources (20%) were the main obstacles, which showed that there was a knowledge practice gap despite positive attitudes. **Conclusions:** Despite the fact that the majority of operating theatre staff showed sufficient knowledge and good attitudes to aseptic techniques and infection control, there is still a lot to be desired in decontamination, validation of sterilization, and storage of the instruments.

INTRODUCTION

Surgical instruments are specially designed to modify tissue or provide access during operations. Some common instruments used in surgery are scalpels, forceps, scissors, needles, and retractors. Handling is hence critical to safety, mobility efficiency, and prevention of tissue and instrument damage [1]. In the context of adverse events, it is noted that surgical patients have the highest risk of these events in the hospital and that many of these events result from failures of non-technical skill in the operating room. The WHO surgical checklist was developed due to this problem being recognized worldwide, leading to a decrease in surgical complications and deaths related to surgery, as well as an improvement in the communication with the surgical team and an increase in the quality of care [2]. Nosocomial infections, often known as infections contracted during hospitalization, are infections that strike patients in healthcare facilities in settings where these do not pre-exist at the time when the patient is admitted [3].

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Several pathogenic microbes are involved in the pathogenesis of this type of infection, particularly 'Pseudomonas aeruginosa', 'Staphylococcus species', and 'coagulase-negative staphylococci' [4]. One of the important and most frequent sources of infection in the hospital setting is the operating theater, where the skin barrier is penetrated and the body is exposed to easily acquire infection easily and, according to a study, ~30% of patients who undergo surgery develop post-procedural infection. In clinical practice, the appropriate application of protocols that can effectively control the rate of infection in postoperative settings plays a vital role in infection control. Sterile technique plays a big role in preventing and controlling infection in the theatre by applying the principles of sterile technique; therefore, the OR nurses must have knowledge and measures taken by health care workers to prevent the contamination of surgical wounds [5]. Despite this, adherence to the sterile technique principle is still low, and operating room nurses have a good attitude toward practicing the sterile technique [6]. However, several studies have shown that the OR nurses' clients are associated with expenses, mortality, and morbidity. One of the main concerns is that the perioperative team's antibiotics are still surgical site infections (SSIs) [7]. SSIs are responsible for 75% of deaths and have a 3% fatality rate. If aseptic and sterile procedures are not followed, bacteria can enter the wound through surgical wounds and cause SSI [8]. Every year, SSIs endanger the lives of millions of people and help promote resistance to diseases that are directly linked to them [9]. The operating room (OR) serves as a location for performing surgeries and other medical procedures. Characters and models are created by the nature of surgeries; the work of an OR nurse, or intraoperative nurse, is crucial in hospitals today and involves treating patients [10]. Their duties include more than just providing fast-paced, high-load, and variable nursing care in the operating room. Basic medical care, cleaning and circulation, anaesthetic skills, engineering, and technical skills have all advanced quickly along with medical research and technology [11]. Furthermore, the intricacy of the surgical workplace is physical, chemical, biological, ergonomic, and psychosocial, and poses a threat to the physical and mental health of intraoperative nurses. Occupational hazards and nurses' safety have been influenced by a range of occupational risks and hazards, ranging from accidents to well-being in differing degrees [12]. Recent years have seen the emergence of organizational views, all of which have the ability to impact highly significant global challenges. Related studies have also shown that OT staff should be aware of the proper handling and disposal of surgical instruments. Lack of knowledge about asepsis, sterilization, and proper instrument handling is a risk factor for cross-contamination and infection. The researchers note that OT staff typically have insufficient knowledge of infection control practices and the importance of complying with the sterilization process [13, 14]. Research showed that the majority of the staff knew general infection prevention protocols, but many did not know the specifics involved in proper instrument handling, such as which items would maintain sterility or the importance of personal protective equipment (PPE). Likewise, from their research they found surgical nurses had limited knowledge on the correct way to clean and store surgical equipment, indicating the need for further education and training [15]. The researchers also found that OT nurses who understand the importance of infection control have responsible attitudes and subsequently have better practices in maintaining sterile environments during surgical procedures. Instrument safety, in practice, is still not universally applied between hospitals or around the surgical space. Instruments are only effective to the extent that they are used routinely in practice by OT staff trained in the correct practices to ensure the best outcomes when executed by the technicians; however, poor practices and adherence only to what they think is in their best interests leave others at risk [16]. The Professionals found that high-volume hospitals with stringent protocols had staff more likely than their counterparts in smaller institutions with less formalized procedures to follow the best practices in handling instruments. They also noted that although knowledge and attitude were generally good, there were deficiencies in practice, often due to time constraints, lack of appropriate resources, or inadequate supervision. There were various deviations from standard practices, which led to increased risk of contamination and infection, including inadequate instrument sterilization, insufficient storage conditions, and not discarding instruments in a sterile way [17]. The role of the scrub A PN or surgical technologist can serve as a part of the sterile team and perform the scrub job (Association for Peri-Operative Practice, 2014:210). A scrub practitioner is responsible for designing, putting down, and managing surgical instruments, besides keeping the sterile area. Among the greatest tasks of scrub is to foresee the requirements of the surgeon and offer reactive help to ensure a smooth surgical process. The circulator is implemented along with the counting of surgical equipment and the prevention of surgical objects being held back [17]. The adequate handling of the intraoperative instruments is central to the achievement of the precision of the surgery, its sterility, and the safety of the patient. Nevertheless, the lack of consistent compliance with aseptic practices and procedural guidelines among operating theatre staff remains a triggering factor in the occurrence of surgical site infections and inefficiencies in operating theatres.

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Although proper handling of surgical instruments is critical for preventing surgical site infections and ensuring patient safety, consistent compliance with standardized intraoperative protocols remains suboptimal. Existing literature highlights adequate knowledge and positive attitudes among operating theatre staff; however, gaps between knowledge and actual practice persist, particularly in resource-limited healthcare settings. In Pakistan, limited empirical evidence is available that comprehensively evaluates the knowledge, attitudes, and practices of OT personnel regarding intraoperative instrument handling. This lack of context-specific data underscores the need for systematic assessment to identify practice gaps and influencing factors. To evaluate their knowledge, attitude, and practice, strengthen institutional compliance frameworks.

METHODS

The study involved a descriptive cross-sectional study carried out in the Operating Theatres of Chaudhry Muhammad Akram Teaching and Research Hospital, Lahore, in the period between October 2024 and April 2025, to assess the knowledge, attitudes, and practices of operating theatres personnel with reference to instrument handling. The research was conceived by the Institutional Review Board (IRB) of Superior University with reference number SU/IRB/FAHS/MS/S100345 and informed consent was signed by the participants. The sample size was determined based on the standard formula of estimating proportions in a finite population with an assumption of prevalence of 50, 95% confidence level (Z = 1.96), and 8 percent margin of error; a sample size of 150 was obtained; however, considering non-response, the sample was reduced to 145. The sampling was purposive non-probability, in which operating consultants, collaborating surgeons, scrub nurses, and OT technicians were recruited, and pre- and post-recovery staff, sterilization staff, storekeepers, and helping staff were not. Intraoperative teams were the subject of the data collection conducted in the form of structured surveys, interviews, and observations. IBM SPSS Statistics version 29 was used to analyze data, in which descriptive statistics, including frequencies, percentages, mean, standard deviation, and median, were used to summarize the data.

RESULTS

This descriptive cross-sectional study provided some intriguing results regarding the overall theoretical knowledge about the handling of the instruments by the personnel in the operating theatre (OT), identifying a strong variation at the level of the consistency of the procedures. Fifty percent (50.3%) reported that they could only accept sterile areas of surgical instruments and 37.3% participants thought that it was okay to handle any clean area, and 12.4% did not know. Even though 60 percent of them checked the instruments as clean after each use, the percentage of those who did it less frequently is significant, which indicates the lack of full compliance with the guidelines on infection control. The majority of the participants (78.5) have found the use of autoclaving as the best type of sterilization, but 21.5% have found sub-optimal options like alcohol swabs or dry heat. Positively, 85.4 percent reported that dirty equipment ought to be substituted right away, whereas a minority would proceed or were uncertain, and this left a relative risk of practice. More than that, only 43 percent of them knew how to pass instruments correctly without violating sterility, and there were gaps in their procedures despite sufficient knowledge. On the attitudinal level, the subjects of the study were positive and safety-oriented. Almost one out of every ten (89) respondents thought that proper handling of instruments was of the utmost importance to patient safety, and 69.9% of the respondents felt that they received sufficient training. Confidence levels were very high, with 47.6 percent of them saying that they were very confident and 39.9 percent being somewhat confident. A majority of 88.8% responded that safety measures should be strictly adhered to, whereas 80% responded that mishandling of instruments is a factor that leads to complications of surgery. These reactions are indications of a positive professional demeanor, which is in congestion with the principles of patient safety and the awareness of the personnel regarding their clinical roles. Practical compliance with these principles, on the contrary, was a bit vague. Though 81.8% said they always adhered to the standard procedures, 14% said they only did so occasionally, and 4.2% said that they never or hardly ever did it. Where the sterility of an instrument was in doubt, 62.2% of the respondents put the instrument away and took another one, and 29.4% would ask another colleague before doing so. A minimal number chose to check or reuse without verification, which is indicative of lapses that may result in the impairment of sterility. Only less than half (44.8>25% of participants attended refresher courses regularly, and 15.3% had never attended because of limited opportunities. On an optimistic note, the percentage of people who took safety tools or devices was 76.2 percent, and 87.4 percent kept their operating environment clean and orderly, which showed that the general level of procedural discipline was rather high (Table 1).

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Table 1: Knowledge Assessment, Attitude Assessment, and Practice Assessment of Operation Theatre Personnel (n=145)

Questions	Response	n (%)
Knowledge Assessment		
Correct Technique for Handling Surgical Instruments	Hold Instruments by Sterile Part Only	73 (50.3%)
	Hold By Any Clean Part	54 (37.3%)
	Not Sure	18 (12.4%)
Frequency of Inspection Before Use	After Every Use	87 (60.0%)
	Once Daily	35 (24.1%)
	Occasionally	23 (15.9%)
Appropriate Method of Sterilization	Autoclaving	114 (78.5%)
	Alcohol Swabs	15 (10.4%)
	Dry Heat or Others	16 (11.1%)
Response to Contaminated Instruments	Replace With Sterile Instrument	124 (85.4%)
	Continue Using	10 (6.9%)
	Unsure	11 (7.7%)
Correct Way to Pass Instruments	Hand Without Touching Sterile Part	62 (43.0%)
	Pass by Handle Directly	46 (32.0%)
	Other/Unsure	37 (25.0%)
Attitude Assessment		
Importance of Proper Instrument Handling for Patient Safety	Extremely Important	129 (89.0%)
	Moderately Important	13 (9.0%)
	Slightly Important	3 (2.0%)
Adequacy of Training	Adequately Trained	101 (69.9%)
	Need More Training	41 (28.0%)
	Unsure	3 (2.1%)
Confidence in Proper Handling	Very Confident	68 (47.6%)
	Somewhat Confident	57 (39.9%)
	Not Confident/Not Sure	18 (12.6%)
Belief About Safety Protocols	Should be strictly followed	127 (88.8%)
	Useful but flexible	4 (2.8%)
	Not necessary/unsure	12 (8.4%)
Belief That Mishandling Causes Complications	Yes	115 (80.0%)
	No	9 (6.0%)
	Maybe	19 (13.0%)
Practice Assessment		
Following Standard Protocols	Always	117 (81.8%)
	Sometimes	20 (14.0%)
	Rarely/Never	8 (4.2%)
Action When Sterility is Uncertain	Discard and replace	89 (62.2%)
	Ask colleague	42 (29.4%)
	Check personally	9 (6.3%)
	Use without asking	3 (2.1%)
Participation in Refresher Courses	Regularly	65 (44.8%)
	Occasionally	58 (39.9%)
	Never/No opportunity	22 (15.3%)
Use of Safety Tools/ Devices	Always	110 (76.2%)
	Sometimes	22 (15.4%)
	Never	13 (8.4%)
Maintaining a Clean, Organized Environment	Always	127 (87.4%)
	Most of the time	11 (7.7%)
	Rarely	7 (4.9%)

Collectively, these findings highlight a strong foundational knowledge and positive attitude among OT staff but reveal partial gaps in consistent practice. Strengthening routine training, supervision, and institutional policy enforcement could bridge the existing knowledge–practice divide and further enhance patient safety within the intraoperative setting.

DISCUSSION

The modern environment has come with certain challenges to the safety of surgery, which require continuous training to successfully overcome these complicated processes. Antibiotic resistance, alteration, and enhancement. The evolving nature of surgical procedures, including the advanced ones that require strict follow-up of sterile guidelines and tactical planning of using antibiotics [18]. The risk of dealing with infections in surgical facilities is quite high because the number of aged individuals, who have several other medical conditions at the same time, increases. Such surgical techniques as robotic surgery, laparoscopy complicate the situation where surgical teams have to make decisions preoperative. This will require tailored measures to minimize risks, effective errors, resolution of problems caused by communication malfunctions, complicated processes, antibiotic resistance, and numerous improvements in surgical safety. The motivation levels of the healthcare community to maintain the highest standards of patient care manifest in the ability to evolve and address the past achievements and present-day challenges in surgical standards, including the World Health Organization (WHO) Surgical Safety Checklist, which enables reducing medical conditions among patients to an insignificant level, and the necessity of improvement [19]. It is necessary to enhance communication, coordination, and coordination in surgical teams to guarantee patient safety. Standard continuous training, judicious antibiotic therapy, and tailored preoperative testing are all safe measures [20]. Based on the results, three-quarters of the OT staff were knowledgeable enough regarding the policy of infection control, aseptic practices, and sterilization of instruments. The areas of decontamination methods, storing of instruments, and monitoring of sterilization were indicated as deficient, however. To avoid infection and ensure the safety of patients, the knowledge about the right way to handle instruments should be very basic among the OT staff members. The decrease in the chances of contamination involves a sufficient knowledge of aseptic methods, sterilization procedures, and proper storage of instruments. Studies have indicated that many OT staff members have varying levels of knowledge on sterilization procedures, which has been a problem in the ability to effectively implement infection control procedures. This knowledge gap can be caused by a high

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turnover rate in healthcare organizations, the absence of continuous education, and inadequate training [21]. The attitude of the majority of the OT staff was good; 80 percent of them concurred that proper handling of instruments reduces surgical site infections (SSIs). Nevertheless, compliance remained affected by such factors as workload, time limitation, and lack of resources. The attitudes of OT staff members towards the instruments and infection control influence their work in the operating room significantly. To keep the level of care high, it is necessary to have good attitudes towards infection prevention, the knowledge of the importance of adhering to sterile procedures, and the desire to participate in further education programs. OT professionals, with a strong and safety-oriented mentality, would be more cautious with surgical tools, communicate better with other team members, and adhere to procedures more strictly [22]. But 60 percent of the staff never followed through with the proper procedures of handling the instruments, even when they had positive attitudes and high degrees of knowledge. Among the most common shortcomings of practice were inappropriate changing of gloves, failure to dry an instrument before sterilization, and failure to use aseptic transfer methods. The actual instrument handling practice between the OT professionals is tested on knowledge and attitude. Time limitations, workload of the staff, and environmental aspects, such as the OR arrangement, can affect the actual practice of maintaining a sterile field, working with a surgical instrument, and obeying sterilization rules, despite having all the necessary information and a positive attitude [23].

This study is limited by its cross-sectional design and purposive sampling, which may restrict generalizability and prevent causal interpretations. Data were collected from a single healthcare setting and relied partly on self-reported practices, introducing the possibility of response bias. Future studies should adopt multicenter, longitudinal, or interventional designs to better assess compliance trends over time. Additionally, evaluating the impact of structured training programs, supervision, and institutional policy enforcement could enhance adherence to standard instrument-handling protocols and improve surgical safety outcomes.

CONCLUSIONS

The research concluded that there is a significant disparity between the knowledge of the operating theatre staff and their practice. The majority of the participants were well aware of the aseptic methods, sterilization, and infection prevention, but there were still some gaps in decontamination, monitoring of sterilization, and storage of instruments. Even after demonstrating an attitude of being good in the handling of instruments that are safe, many of them did not engage in proper procedures because of high workload, time pressure, and lack of resources. The findings demonstrate that continuous training, improvement of supervision, and institute policies can help guarantee consistent compliance and enhance the results of surgical safety.

Authors' Contribution

Conceptualization: IUDK, MM, LM, MMA
Methodology: MM, LM, T, MMA, TT
Formal analysis: IUDK, MM, TT
Writing and Drafting: IUDK, ASR, LM, T, MMA, TT
Review and Editing: IUDK, ASR, LM, T, MMA, TT, MM

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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