COLLEGE OF HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

DEPARTMENT OF NURSING, PERIOPERATIVE NURSING

POST GRADUATE PROGRAM

Teamwork Performance And Its associated Factors Among Operating Room Professionals Working In Selected Public Hospitals, Addis Ababa Ethiopia, 2023

By Hiwot Misganaw (BSc)

A Research Thesis To be submitted to Addis Ababa University, College of Health Sciences, School of Nursing and Midwifery, Department of Nursing, for partial fulfillment of the requirements for degree of masters of Science in perioperative (Cardiothoracic) Nursing.

Addis Ababa, Ethiopia

May, 2023

Addis Ababa University

College of Health Sciences

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May, 2023

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STATEMENT OF DECLARATION

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation. I affirm that I have cited and referenced all sources used in this document. Every effort has been made to avoid plagiarism in the preparation of this thesis.

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ACKNOWLEDGMENT

Firstly, I would like to express my gratitude to Addis Ababa University, College of Health Sciences, and Department of Nursing in general for providing the opportunity to undertake this research which is helpful in my future carrier.

Secondly, my grateful thanks go to Eka Kotobe General Hospital for sponsoring me to learn this master's program.

Thirdly, I would like to forward my deepest gratitude to my advisors Mr. Tefera M. (MSC, Assistant Professor, PHD fellow) and Sr. Nete T. (MSC, Lecturer) for their constructive comments and recommendations.

Next, I would like to give my special thanks to Administrative and Operating room staffs of selected public Hospitals at Addis Ababa for their direction and help on background information of this proposal development.

Finally, I would like to give grateful thanks to study participants for their precious time and commandment during base line data.

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LIST OF ABBREVIATIONS AND ACRONYMS

AAU:	Addis Ababa University
ANA:	American Nurses Association
AORN:	Association of Operating Room Nurses
ETB:	Ethiopian Birr
IPO:	Inputs, Processes and Outputs
LOS:	Length of Hospital Stay
NOPEs:	Non-operative Procedural Errors
NOTECH:	Operating Theater Team Nontechnical Skills Assessment Tool
NOTSS:	The Nontechnical Skills for Surgeons
NTS:	Non-technical skills
OT:	Operating Theatre
OTEs:	Operative technical errors
OR:	Operating room
OSATS:	Objective Structured Assessment of Technical Skills
OTN:	Operating theatre
SPHMMC:	St. Paul's Hospital Millennium Medical College
SPH:	St. Peter's Hospital
TASH:	Tikur Anbessa Specialized Hospital
WHO:	World Health Organization

ABSTRACT

Background: Effective teamwork performance in the operating room is critical for safe, high-quality care; however, few studies worldwide have documented that suboptimal operating room teamwork performance is very common and that teamwork issues occur to varying degrees in every surgery. Operating room teamwork performance in low- and middle-income countries, including Africa is understudied.

Objective: The aim of this study was to assess teamwork performance and associated factors among Operating Room Professionals working in selected public hospitals, Addis Ababa Ethiopia, 2023.

Methods: Institutional based cross-sectional study design was conducted at selected public hospitals from April, 01 to April, 30/2023. Five hospitals were chosen by lottery method, and operating room teams were recruited in proportion to the number of teams, followed by simple random sampling from the respective hospitals. The observation checklist was used to evaluate teamwork performance. A structured questionnaire was also used to collect basic professional information. Pretesting of instruments was performed and collected data were cheeked and entered in to Epi-data version 4.6 for data cleaning and imported to SPSS version 26.0 software for analysis. Associations between independent and dependent variables were analyzed using a binary logistic regression model with bivariables and a multivariable logistic regression analysis technique. P-values < 0.05 were considered statistically significant.

Results: The overall operating room professionals' teamwork performance was poor, 121 (74.16%). Age of 31-40 years [(AOR=0.54, p=0.021; 95%CI (0.33, 0.76)], team familiarity [(AOR=3.56, p=0.01; 95%CI (2.51, 3.92)], cases being complicated/sever [(AOR=3.16, p=0.004; 95%CI (1.45, 6.90)] and availability of supplies [(AOR=1.5, p=0.004; 95%CI (1.58, 2.15)] were factors associated with teamwork performance.

Conclusion and recommendations: This study concluded that, about 75% of operation room teams had poor teamwork performance compared to different literature in other parts of the world, where personal and organizational factors associated with teamwork performance. To protect patients undergoing surgery in the study area and elsewhere in the country, it needs to devise measures to improve operation room professionals' teamwork performance such as training on soft skill (non-technical skills) technology.

Key words: Surgical team, Teamwork, teamwork performance, Ethiopia

1. INTRODUCTION

1.1. Background of the study

Nowadays, as the disparities between the cost and quality of the healthcare system become more evident, surgical care aims to improve patient safety, quality, and outcome. The operating room (OR) is one of the system's most closely need attention because it is a high-risk setting for adverse events and incurs high costs. In operating rooms, 66% of surgical errors occur, and 54% of these errors could be prevented with effective teamwork (1).

Suboptimal operating room professional teamwork performance is evident both in developed and developing countries. It was from 20% to 30% in America (2, 3) 16.8% to 33 (67.6%) in Europe (4) and about 25% to 43% in Africa (5). poor performance was associated with negative consequences of intra-operative and post-operative outcomes (6).

Effective teamwork performance is crucial for safe, high-quality healthcare (7, 8). It is essential in the operating room (OR), where experts from different fields, educational backgrounds, and professional experiences must collaborate in a demanding setting (7). Unquestionably, modern surgical care is a team effort. No single provider can complete the continuum of care (9). The OR teams consist of several kinds of professionals, including surgeons, anesthesiologists, anesthetists, nurses and surgical technicians (10).

Although the clinical expertise of each team member is crucial for ensuring high performance, teams also need to be able to apply and combine each member's specific expertise to maintain safety and achieve optimal performance. For a team to be successful, each member must cooperate and practice teamwork. Experts now concur that strong teamwork at all levels of the healthcare system is the foundation for safe and efficient care (11).

A team is a group of individuals who collaborate to achieve common goals and objectives, such as providing high-quality services (12). Teamwork is the interaction of team members who pool their resources to meet task demands (13). The sum of a team's individual interactions with tasks, tools, machines, and systems (what the team actually does) is referred to as task work, and together these two components make up team performance (14). To

describe team performance, inputs, processes, and outputs (IPO) are frequently used. Team-related processes (teamwork) such as communication, coordination, or decision-making influence outputs such as care quality, errors, or performance (11, 12).

Patient safety during surgery is largely determined by the effectiveness of the surgical teams' combination of technical (clinical knowledge, dexterity, and equipment use) and non-technical skills (cognitive and social skills) (15-17). Non-technical skills (NTS) in the operating theatre (OT) are currently attracting increased attention because preventable adverse events are caused primarily by this skill rather than technical skill. Non-technical skills are defined as the cognitive, social, and personal resource skills that complement technical skills and contribute to the safe and efficient performance of tasks (17).

The effectiveness of the surgical teamwork may be impacted by various factors, such as socio-demographic, team related, patient related and hospital related factors endangering patient safety as revealed by different studies. Therefore, the investigator of this study is interested to asses where the same or others factors determine the surgical team's performance in terms of non-technical abilities (cognitive and social skills) in our country Ethiopia.

1.2 Statement of the problem

Because of the complexity of the operating room (OR) and poor teamwork performance, unpredictable rates of adverse events resulted each year from more than 200 million surgeries performed worldwide (1, 18). Thus, good teamwork performance in the OR is required, which is critical for patients with a variety of conditions as well as for safe, high-quality healthcare (8). The overall burden of surgical teamwork performance is now days becoming public health importance. According to the Joint Commission, 56% of intraoperative and postoperative complications are caused by poor teamwork performance (19).

Furthermore, evidences show that poor surgical team work performance results in significantly higher patient complications. A study in USA found that, from all cases followed, the composite measures of teamwork performance across perioperative phases, about 25% sentinel effect was seen from them 15% of minor complication and 6% of major complication. These figures revealed a significant link between teamwork performance and patient complications including death (6). Another study found that poor surgical teamwork increases mortality rates by about 6% when compared to good teamwork in UK (20).

Evidence supports incidents such as missed gossip, shock, prolonged recovery due to anesthesia, near miss, death, surgical site infections, length of hospital stay, and failure to identify correct patient for surgery, among others, as a result of poor teamwork performance (21). These avoidable errors can have disastrous consequences for patients, as well as personnel who work directly with patients and healthcare organizations (22). Effective teamwork can prevent half of these negative outcomes (22, 23).

These preventable adverse events are primarily the result of poor teamwork performance, which is brought on by a number of factors including workload, pressure to complete complex tasks, patient clinical factors, team members' prior work experiences, perceptions and attitudes toward teamwork among surgical teams, and competing priorities Most studies to assess teamwork performance were focused on technical skills, while the issue of non technical was not stressed (16, 24).

Few strategies were tried to enhance the level of surgical teamwork performance and minimizing the technical and non-technical errors. World health organization (WHO) introduces surgical safety checklist to enhance team communication, leadership and situation awareness mechanism to minimize risk of patient complication through safe surgery saves lives is among such strategies (25). Again the studies conducted in developed countries also suggested that, promoting effective surgical teamwork performance is a principle of safe care to minimize the preventable errors in surgery. and more of them were focused on technical (instrumental) skill performances (22, 26).

However, there is still a problem with suboptimal teamwork performance in operating room teams. More of studies were focused on technical (instrumental) skill performances while most surgical complications which lead to malpractice claims do not originate from intraoperative technical errors (teams' clinical knowledge, dexterity and use of equipment). Rather, it stems from a lack of non-technical skills (cognitive and social skills), like poor task management, ineffective communication, and information sharing (13, 17). The success of OR is based on high-performing team works in non technical skill measured by leadership and management, teamwork and cooperation, problem-solving and decision-making, and situation awareness options which prevent an error from causing harm (27, 28).

There has been a recent proliferation of interventions to improve teamwork in the OR setting, but the impact of these interventions on non technical skill has yet to be assessed. Again, so far surgical teamwork performance in low- and middle-income countries, including Africa, is understudied, and no study has been conducted on surgical team work performance in Ethiopia to investigator’s knowledge. Therefore, this study will be carried out to investigate the Operation room teamwork performance and associated factors at selected public hospitals in Addis Ababa.

1.3. Significance of the study

Investigating surgical teamwork performance and related factors will be the aim of this study. Surgical teams work in a complex, high-risk environment where there is a chance for negative outcomes such as severe injury or patient death, as well as for personnel to become contaminated and sustain injuries from sharp objects and medical facilities. In order to improve operating room teamwork performance, it is important to evaluate surgical teamwork performance and related factors that have a negative impact on surgical events. The results of this study will therefore be important in the following ways.

This study's findings will be useful in increasing support by recommending provision of training on non technical skill in teamwork performance and others for the surgical team in improving team performance.

The study findings will also be useful for health administrators and policymakers by providing imminent gaps that need either current interventions are need change, or decision on policy modification or chan.

The study's findings will be useful for academic purposes, especially for theatre workers, by providing a data base from which information for future research in related areas of study can be obtained. The study's findings will also be useful to researchers as baseline data for future research.

2. LITERATURE REVIEW

Science Directives such as PubMed, MEDLINE, CINAHL, Sage journal online, and Google scholar, among others, were searched to gate relevant literatures. The key terms used were surgical teamwork, teamwork performance, non-technical skills, cognitive or social skills, personal resource skills, operation room or operating theatre nurses, coordination, decision-making, leadership and communication in combination with patient safety, clinical performance and factor affecting surgical teamwork performance. After reviewing various literatures, overview and level of surgical team performance, factors associated with teamwork performance such as socio-demographic, team related, patient related and hospital related factors and conceptual frame work were presented under this section.

2.1 Overview of surgical teamwork performance

In health care settings, teamwork is widely acknowledged as an important factor in providing high-quality patient care. To understand the impact of teamwork on performance, a brief overview of teams, teamwork, and team performance is required. A surgical team is a group of people who work together to achieve the common goal of patient care and who each have specialized roles that necessitate specialized knowledge and abilities (29). Teamwork is the process of interactions between team members who pool their resources to meet task demands (11, 30) or team processes are distinct from task work. Task work is the individual interaction of a team with tasks, tools, machines, and systems (31).

Task work, which is frequently described as what a team is doing, is independent of other team members, whereas teamwork is how team members interact with one another (31). Thus, team performance is the sum of teamwork and task work (32, 33). Teamwork performance in health care setup is measured by surgical outcome. This includes evaluating the entire team's technical (instrumental) skill as well as non-technical skills (NTS) such as leadership and management, teamwork and cooperation, problem-solving and decision-making, and situation awareness. In contrast, the clinical outcome of surgical team performance is highly dependent on the NTS component, because preventable adverse events are caused primarily by this skill rather than technical skill (34). Therefore, the study's investigator is motivated to evaluate the level of surgical team performance of NTS components.

2.2. Level of teamwork performance

Few studies conducted around the world have shown that, poor teamwork performance among OR professionals, (suboptimal performance) is very common and that teamwork issues occur to varying degrees in every surgery. According to studies conducted in America poor team work performance were from 20% to 30% (2, 35, 36). This shows that the level of poor teamwork performance is evident even in developed countries.

Another study conducted in England reported that the overall teamwork performance with good rating was 73(67.6%), while that scored with poor performance was 16.8% and this significantly associated with negative consequences of intra-operative and post-operative outcomes (37). When compared to the previous finding of poor teamwork performance among OR professionals, the finding of the English study is fair.

Again, another study done in Scotland revealed that, about 18.5% of poor level of teamwork was recorded from overall performance with poor situational awareness, teamwork, leadership, and management abilities were a common weakness for the team, which contributed to the majority of intraoperative incidents and postoperative recovery (38).

In addition, the study conducted in Finland revealed that, the overall teamwork performance in their ORs 75(83.3%) as positive, with dimension of teamwork performance (mean = 5.6; SD = 0.6) were experienced as quite good (39). This shows that about 16.7% teamwork performance is poor. However, the findings of a study conducted in Kenya revealed a high level of teamwork performance of about 35%, implying that there are numerous factors influencing this serge value (40).

2.3. Factors associated with surgical teamwork performance

2.3.1. Socio-demographic factors

Different studies revealed that, socio-demographic factors of surgical teams were significantly associated with teamwork performance. The study conducted on measuring the teamwork performance of operating room teams: a systematic review of assessment tools and their measurement properties reported that, sex, marital status, years of work experience and level of education has significant association with team work performance of surgical centers (41).

The finding of study conducted in Netherlands revealed that, there was significant association between age, work experience and working unit of the team and teamwork performance in surgical center (P-value ¼ 0.310, 96%CI –0.83 to 4.06) (42). This inferred that as professional become expertise and the area of work can determine the level of team performance. Again the finding of studies conducted in Japan reported that, age, being married, years of work experience in the operating room years has a significant association with teamwork performance ($p < .001$). This study reported that, years of experience in the operating room ≥ 4 years has a significant association with teamwork performance with $p < .001$ (16).

In Addition, the conducted in Iran showed that, there is a significant relation between the teams' educational level and marital status and their teamwork performance. The team member with higher education considered good level of teamwork performance ($p \leq 0.04$) than the team member with a lower educational level (13). In contradiction the studies conducted in United States, Netherlands, Japan reported that, there were no statistically significant decreases in operating room teamwork performance and years of work experience ($p > 0.05$) (43-45).

2.2.2. Cases related factors

Few studies around the globe showed that clinical condition of the patient, site of operation and urgency of the case are significantly associated with team work performance. The study conducted in Canada revealed that, clinical acuity (severity of cases) and duration of operation are significantly associated with teamwork performance (P-value=0.012, 96%CI 0.83 to 4.06). This study also revealed that heightened urgency cases were significantly associated with team teamwork performance with (P-value=0.02, 96%CI 1.83 to 3.01) (8). This implies whether concentration or distraction occurred due to clinical condition of the patient that has an impact on the level of teamwork performance

Again study conducted in Japan showed that, cases operated for deteriorated patients were significantly associated with team work performance with (P-value<0.003) (46). The study conducted in Iran revealed that, Surgical site (abdomen and head) and duration have significant association with teamwork performance with (P-value<0.04) (47). Again the study conducted in

Iran, showed that, site of operation (neck) has significant association with teamwork performance with (P-value=0.01, 96%CI 2.83 to 9.06) (48). However the study conducted in Iran showed that there is no significant association between patient's factors and surgical team performance (44).

2.2.3. Team members related factors

Few studies revealed that, surgical team members factors such as conflicting professional (perceived differences in role and power), familiarity (different professional socialization) of the team, perception and attitude of members towards team work are significantly associated with teamwork performance. The study conducted on understanding teamwork in rapidly deployed inter-professional teams in intensive and acute care: on systematic review reported that, familiarity (knowing other team members) and good team sprit have relation with work performance than unfamiliar team members (49).

The study conducted on the relationship between teamwork and performance in healthcare teams: a systematic review and meta-analysis showed that, attitude of team members towards team work, conflicting professional difference and familiarity within the team and professional communication (in manner of respecting each other) has significant association with teamwork performances. This finding reported that, conflicting professional difference, has significant relation with team performance with the sample-sized weighted mean correlation was 0.28 (95% CI 0.20 to 0.35, $z=6.55$, $p<0.001$) (11).

In contrast of these the study conducted in USA showed that, being familiar within the team has no relationship with teamwork performance with p-value of >0.05 (50). However, the study conducted in Canada confirmed that (perceived differences in role and power) for example leadership from a nursing perspective would be very different than leadership from a physician perspective, thus based on their roles and power conflicting professional difference has both negative and positive association with teamwork performance with $p<0.001$) (8).

Again another study conducted in Australia revealed that, professional socialization experiences and structures has positively related with teamwork performance with $p=0.021$) (51). Another study conducted in Japan revealed that, the participants' professional

communication mean scores were found to be significant in the domains of mutual respect and trust, teamwork, workplace conflicts (p≤0.001). This study also reported that, their attitudes toward teamwork has significant association with team work performance with p=0.004 (16)**.** The study conducted in Iran reported that, the teams' perception of the domains of mutual respect and trust ($p \leq 0.001$). Again this study revealed that, perception of professional value professional values have significant association with teamwork performance with ($p \leq 0.016$) was perceived to be significant (8).

2.2.4. Hospital related factors

Few studies revealed that, shortage of resources (human power and supplies) and organization power of giving training for surgical team have significant relation with team work performance. The study conducted in America revealed that, training has positive association with teamwork performance, in which the report showed that, the 74 facilities in the training program experienced an 18% reduction in annual mortality rate ratio [RR], 0.82; 95% confidence interval [CI], 0.76-0.91; $P = .01$) compared with a 7% decrease among the 34 facilities that had not yet undergone training (RR, 0.93; 95% CI, 0.80-1.06; $P = .59$) (41).

The study conducted in UK revealed that teamwork performance was improved after training Oxford Non-Technical Skills (NOTECHS increase 37.0 to 38.7, t = 22.35, p = 0.021, teamwork climate increase 64.1 to 69.2, t = 22.95, p = 0.007). Operating time and length of hospital stay (LOS) and Operative technical errors (OTEs) declined from 1.73 to 0.98 (u = 1071, p = 0.009), and non-operative procedural errors (NOPEs) decreases from 8.48 to 5.16 per operation (t = 4.383, p, 0.001) (52). Again, the study conducted in Germany showed that, surgical performance was better for staffs took training than not took training for total Objective Structured Assessment of Technical Skills (OSATS) (trained=77.4±7.9 vs. not trained=73.8±9.4; p=0.025 (41).

Another study conducted in Nigeria reported that, resource related challenges (equipment and staffing availability) and absence of conducive environment have significant association with teamwork performance ($r = -0.301$, $P < .01$) (53). Again, another study conducted in Kenya revealed that, shortage of human resources (specifically nurses) and supplies has significant association with teamwork performance (p=0.002) (54). However, the study conducted in

America reported that, shortage of suplies for surgical team has no significant association with team work performance (55).

2.3. Summary of Literature

Teamwork performance in the Operating Room (OR) is complex issue and is crucial for patients presenting with different conditions and is essential for safe, high-quality healthcare. Evidence suggests that preventable errors in surgery today more often relate to nontechnical than to technical failures. More studies around the globe suggested that promoting effective surgical teamwork performance is a principle of safe care to minimize the preventable errors in surgery and more of them were focused on technical (instrumental) skill performances.

However, most surgical complications which lead to malpractice claims do not originate from intraoperative technical errors (teams' clinical knowledge, dexterity and use of equipment), but rather from deficiencies in non-technical skills (cognitive and social skills), such as clear and open communication, task management, and information sharing. In addition, there has been a recent proliferation of interventions to improve teamwork in the OR setting, but the impact of these interventions on non technical skill has yet to be assessed.

However, teamwork performance in low- and middle-income countries, including Africa, is understudied; yet no study has been conducted on surgical team work performance in Ethiopia to investigator’s knowledge. As a result, this study will be carried out to investigate the surgical teamwork performance and associated factors in selected Addis Ababa public hospitals.

2.4. Conceptual frame works

Concepts of various studies related to this research questions and factors associated (such as socio-demographic, cases related, team related and hospital related) are summarized in conceptual figure. Here the conceptual frame work adapted and modified from literature is presented blow (16).

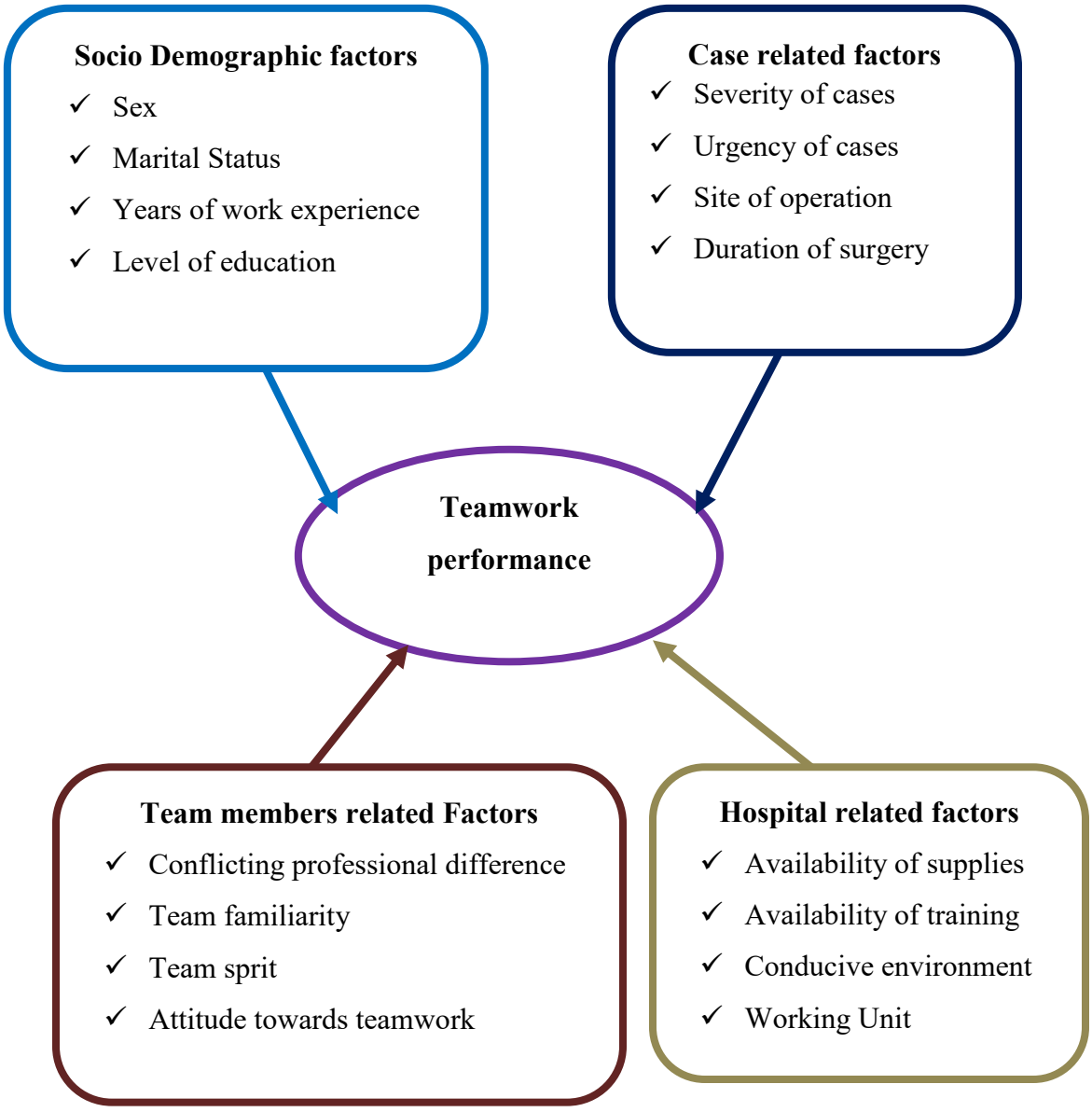


Figure 1: Conceptual framework in the study of teamwork performance and associated factors among OR professionals working in selected public hospitals, Addis Ababa, Ethiopia, 2023.

3. OBJECTIVE OF THE STUDY

3.1. General Objective

To evaluate the level of teamwork performance and associated factors among operating room professionals' in selected public hospitals, Addis Ababa Ethiopia, 2023

3.2. Specific Objectives

- ✓ To evaluate the level of teamwork performance among operating room professionals' in selected public hospitals, Addis Ababa Ethiopia, 2023
- ✓ To identify factors associated with the level of teamwork performance among operating room professionals' in selected public hospitals, Addis Ababa Ethiopia, 2023

4. METHODS

4.1. Study Area and Period

This study was conducted at selected public Hospitals in Addis Ababa the capital city of Ethiopia. The city has a subtropical highland climate. The city is with three layers of governance; at the top 11 subs city administrations in the middle, and 116 woreda administrations at the bottom. It is located between 8055' and 9005' North Latitude and between 38040' and 38050' East Longitude (56). The city has about 14 public hospitals including a state university known as Addis Ababa University College of Health Science Hospital, Namely Tikur Anbessa Specialized Hospital (TASH). Thus the study was conducted in Tikur Anbessa Specialized Hospital (TASH), St. Paul's Hospital (SPaH), St. Peter's Hospital (SPH), Yekatit 12 Hospital ($Y_{12}H$) and Alert Hospital. TASH, SPaH, SPeH and $Y_{12}H$ give services as major tertiary referral hospitals of the country. They also serve as a teaching hospital for the Medical College, providing care to patients in a variety of clinical disciplines such as orthopedics, general surgery, obstetrics, gynecology, pediatrics, cardiothoracic, urology, neurosurgery, and ENT surgery, as well as internal medicine (57). TASH has 800 beds and 9 operating room (OR) tables. The hospital has about 800 nurses of this around 199 were working in OR. SPaH also has around 900 beds, 7 major OR, and about 1000 nurses of this about 213 were working in OR, whereas St. Peter's Hospital has about 250 nurses of which 40 were working in OR and $Y_{12}H$ has 365 nurses of which 56 were working in OR and Alert Hospital has 600 beds and 7 operating room (OR) tables. The hospital has about 800 nurses of this around 199 were working in OR. From the current evidence, TASH has 58 teams, SPaH has 66 teams, Alert Hospital 52 teams, $Y_{12}H$ has 42 teams and SPeH has 27 teams comprising about total 245 operation teams. The study was conducted from Apirl, 01-April 30/ 2023.

4.2. Study design

Institution based cross sectional study design was conducted at selected public hospitals.

4.3. Populations

4.3.1. Source population

All Operating Room teams working in operation theatre at Addis Ababa public hospitals

4.3.2. Study population

Operating Room teams working in operation theatre in selected public hospital during the study periods.

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

Operating Room teams with team members of work experience of 6 months were included.

4.4.2. Exclusion Criteria

Teams participated on minor procedures were excluded because during this procedure anesthesia sub-team may not participated.

4.5. Sample Size and sampling Techniques

4.5.1. Sample Size Determination

The sample was be calculated by using single population proportion formula. Taking p-value 50% because the team work performance was not known at study area to get the maximum sample size, using the following formula, Z = 95% Confidence level, d = 5% marginal error. Thus, required sample size was calculated as;

$$\mathbf{n = \frac{(Z\ \alpha/2)^2\ P\ (1-P)}{d^2}}$$

Where, Z = 95% Confidence interval: Z1-α/2 =1.96, P =0.5, d =0.05

$$\mathbf{n = \frac{(1.96)^2\ 0.5(1-0.5)}{(0.05)^2} = 384}$$

From current data there are about 245 operation room teams formed from senior surgeons different fellows and residents come from different regions of country for sociality certificates, nurses and anesthesia providers in five selected hospitals.

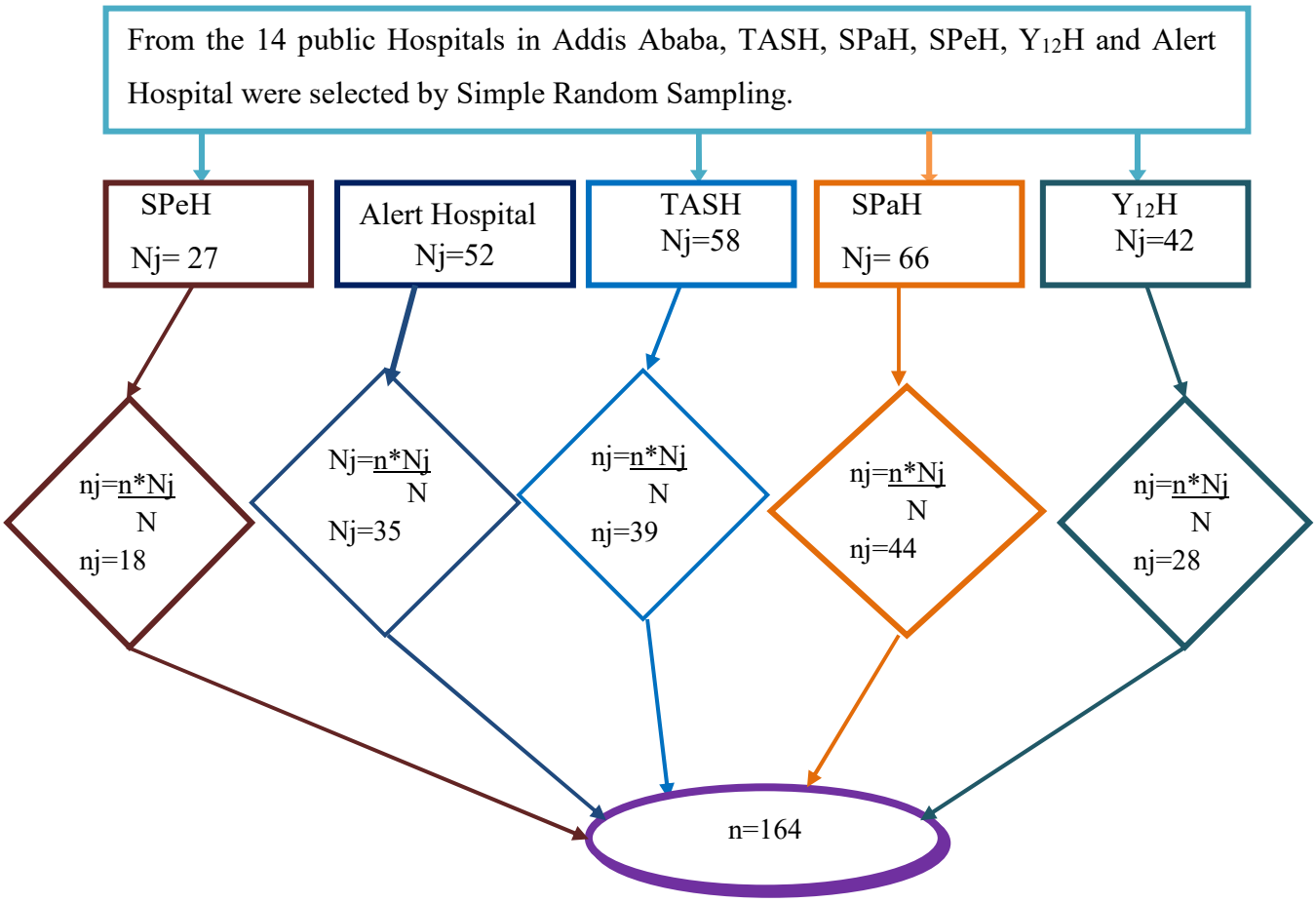
Since the source population (Surgical teams) of this study was less than 10,000 the investigator used population correction formula.

$$nf = \frac{\mathbf{n}}{\mathbf{1 + \frac{n}{N}}}$$

Where, nf = Final sample size, N = Source population = 245, n= Total sample size =384. Thus nf = 384/ (1+384/245) = 149. By adding 10% non response rate the final sample size was 149+149(0.1) = 149+15 = **164**

4.5.2. Sampling Techniques

Five hospitals, TASH, SPaH, SPH, Yekatit 12 Hospital and Alert Hospital are chosen by simple random sampling (lottery method) from total of 14 public hospitals in Addis Ababa. However, among the selected hospitals, proportional allocation to population size was used to recruit surgical teams. Then from the respective units of operating room, simple random sampling (SRS) was made from list of daily scheduled cases and emergency cases using as a sampling frame.



Where "n" = (Total sample size =245), "N" = (Total population/teams per-cases/ selected from selected hospitals =245), "ni" is the n^{th} sample size of each respective hospitals and Ni is the N^{th} total population of each respective hospitals, TASH=Tikur Anbessa Specialized Hospital, SPaH= St. Paul's Hospital, SPeH=St. Peter's Hospital and $Y_{12}H$=Yekatit 12 Hospital.

Figure 2: Schematic presentation of the distribution of the sample size across selected public hospitals in Addis Ababa, Ethiopia, 2022

4.6. Study Variables

4.6.1. Dependent Variable:

Operation Room teamwork performance

4.6.2 Independent Variables:

Socio-Demographic: Sex, marital status, work unit**,** level of education**,** work experience

Team related factors: Conflict in professional difference, team familiarity, attitude towards teamwork, team sprit

Case related factors: Severity of cases, Urgency of cases, Site of operation, surgery duration

Hospital Related factors: Workload, availability of supplies, and availability of training and conducive environment.

4.7. Operational definitions

The OR teams: Consist of several kinds of professionals, including surgeons, anesthesiologists, anesthetists, nurses (Scrub and Circulating) and surgical technicians.

Team work performance: In this study the investigator interested to assess the soft skill (Non-Technical Skills) part of team work performance because it complements technical skills. In addition, it was not possible to assess technical skill for all team at once because there is difference of skill scope between team members. Team work performance of the rate tool used by the mean performance score of all the four domains of $\geq$73% was taken as perfect performance, otherwise rated as poor performance (2).

Non-technical skills: The cognitive, social and personal resource skills that complement technical skills, and contribute to safe and efficient task performance. Social skills include communication, teamwork and leadership, as well as the skills in relation to management of stress and task (2).

Communication and teamwork: Include the process of exchanging information, establishing a shared understanding and coordinating team activities. The team with performing all elements will be rated with good performance, perform two of them rated acceptable performance while with one or non was rated as marginal and poor respectively (58).

Leadership: Setting and maintaining standards, supporting others and coping with pressure.

Cognitive skills include situation awareness and decision making. The team with performing all elements will be rated with good performance, perform two of them rated acceptable performance while with one or non was rated as marginal and poor respectively (58).

Situation awareness: - Refers to the individual's perception of each element or object in the dynamic environment and the prediction of the future state in the specific time and space. If the team performing all elements from 3 elements they was rated with good Situation Awareness, while with one or non was rated as marginal and poor respectively (58).

Decision-making: Is a process in which people come up with ideas and make decisions for various events. It is the process of information collection, processing, and finally making judgments and conclusions. The team with performing all elements was rated with good decision making, perform two of them rated acceptable while with one or non was rated as marginal and poor respectively (41).

Workload: In this sense work load is defined as the need of the work institution, especially those that suffer from a outdated functional capacity, to retain the employee to cover in reverse shifts length of the working day, great demand for tasks and the scarcity of time to carry them and lack of a staff that meets the needs of the sector. If any of the aforementioned scenarios occur, there will be workload. (16).

Attitude: A score of above mean to the attitudinal statements showed that the respondent had positive attitude while a score below mean showed that the respondent had negative attitude to the attitudinal statements (59).

Conducive Environment: is positive working environment that promotes employee safety, growth and goal attainment by focusing on their overall culture; supporting employee growth and making employees feel safe and comfortable. These environments are most conducive to a successful workforce as they encourage employees to perform to their highest ability.

Team spirit enhancing environment: Is a productive environment with open and honest communication, compassionate team members, presence of positive reinforcement, growth opportunities, positive thinking and good work-life balance

4.8. Data collection procedure

Six data collectors (BSC nurses), and three MSc nurses for supervision activities were selected for data collection. All data collectors and supervisors were recruited based on their previous experience on data collection. Partciparatory approach was applied to collect data for

assessing level of team performance using observation checklist without telling what was going to the team. Data was recorded immediately after the completion of the procedure. Socio-demographic and other characteristics information were collected by self administer questionnaire prior to observation check list. The training was given for data collectors and supervisor for one day on method of approaching participants, how to fill the information on a checklist as well as the aim of the study and contents of the instruments. Pretest of the tool of 5% on the was done by the principal investigator in operating theater at Zewuditu hospital 7days before actual data collection which is not included in the study, to assess the content, approach of the tool and to correct unclear and vague issues on the tools.

4.9. Data collection tools

Observation checklist was used for collection of outcome variables while self administered was used for independent variable. The tools were adapted from literatures (16, 41, 58) and modified as objective of the study and tool validity (content validity an assessment of the degree to which each item or question is able to measure what it is supposed to measure) was made by surgical expertise opinion and experts' trained teamwork or health service management two weeks before data collection.

The tool has six parts. **Section 1:** Socio-demographic characteristics of respondents contain 06 items. **Section 2:** Observation checklist to assess teamwork performance assessment 12 items was used (for leadership and management 3 items, for teamwork and cooperation 3 items, for problem-solving and decision-making 3 items and for situation awareness 3 items). The composite mean score of each member per-team was used as cut point to categorize the team as poor or good. If teamwork performance composite is less than mean score of that team work performance the team considered as poor or vise versa. **Section 3:** Case related factors will contain 4 items. **Section 4:** Team related factors had contained 3 items. **Section 5:** Attitude of staffs towards team work had 13 items and **Section 6:** Hospital related factors contain had contained 4 items.

4.10. Data quality control

To assure the data quality, the tool was pre-tested, and necessary, modification (such as adding team members work unit, category of elements was added for main categories, training was added for hospitals related factors, because numbers of staffs and work load go together, the item asked for availability of staffs omitted and etc.) were made. Each tool was checked

for completeness, missed values and unlikely responses; those incomplete tools were omitted from the analysis. Principal investigator and supervisor made spot-checking and reviewing the completed checklist by the data collectors to ensure completeness and consistency of the information that are collected. Before the actual data possessing, entry of 5% of the data to EPI data software package was made to maintain the data quality. In addition, delivering of training for data collectors to make sure data was consistently recorded between them and standardization of checklist during observation procedures to make sure they are structured and clear as well as careful consideration during survey planning and survey design was made to minimize observation bias and other biases.

4.11. Data processing and analysis

The collected data was checked for its completeness and the response were coded and entered in into the computer using Epi data version 4.6 statistical package and the 5% of the responses were randomly selected and checked for the consistency of data entry. Then data were exported to windows of Statistical Package for Social Science (SPSS) version 26.0 for analysis. During the process of analysis, descriptive statistics was used to provide an overall and coherent presentation and description of the data. Binary logistic regression with enter method was done using bi-variable analysis technique to see the crude significant relation of each independent variable with dependent variables. Variables with 95% confidence interval and p-value at <0.25 during the bi-variable analysis were entered to multivariable logistic regression analysis. Odd ratio with 95% CI was performed on multi-variables to determine the strength of association of variables. P-value less than or equal to 0.05 was taken as cut of value to be significant.

4.12. Ethical consideration

Initially ethical clearance for the study was obtained from institutional ethical review board (IRB) of College of Health Sciences School of Nursing and Midwifery, Addis Ababa University. Official permission letter was obtained from school of Nursing and Midwifery as well as from Addis Ababa Health Bureau. Before the beginning of data collection permission letter was provided to the selected hospitals administrative body for data collection. Participation was voluntary and information was collected anonymously after obtaining oral informed consent from each respondent by assuring confidentiality throughout data collection period. Participants were told the objective of the study and their right to refuse to participate

and have the right to stop or withdraw at any time of data collection. Confidentiality was maintained anonymously and collected checklist were kept and locked in safe place and the soft copy was secured in computer with pass words.

4.13. Dissemination of the results

The study finding will be submitted to College of Health Sciences, School of Nursing and Midwifery, Addis Ababa University, Respective selected hospitals and Addis Ababa City Health Bureau. The documents will be disseminated to all responsible bodies. Furthermore, the manuscript will be submitted to national or international peer review journals for possible publication. Hard and soft copies will be made available in the library of Addis Ababa University for other researchers and reader.

5. RESULTS

5.1. Socio-demographic characteristics of participants

From total 164 samples, about 780 Operation Room professionals categorized in 161 teams were participated in this study. The rest three samples left due to repeated peoples and some seniors were absent due to savatican leave. The mean age of participants was 37.07 with Std. deviation+ 9.32 and age range of 35. Teams with majority of age group >40 years were 49(30.18%), with majority were male 84(52.17%), with majority were married 119(73.91%). Greater part 95 (59.00%) of the study participants had >10 years of work experience (Table 1).

Table 1: Socio-demographic characteristics of Operating Room teams working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

S.N	Characteristic	Frequency	Percentage
1	**Age**		
	23-30 years	40	24.48
	31-40 years	73	45.34
	>40 years	49	30.18
2	**Sex**		
	Male	84	52.17
	Female	77	47.83
3	**Marital status**		
	Single	28	17.39
	Married	119	73.91
	Widowed	14	8.70
4	**Work experience**		
	<5 years	28	17.39
	5-10 years	38	23.61
	>10 years	95	59.00
5	**Unit of Work**		
	Major OR	76	47.20
	Emergency OR	23	14.30
	Orthopedic OR	21	13.04
	Gynecologic OR	21	13.04
	Chest OR	17	10.56
	Neurologic OR	3	1.86
6	**Level of Education**		
	BSc	44	27.33
	MSc	52	32.30
	Specialty certificate	65	40.37
7	**Profession**		

	Nurse	65	40.37
	Anesthetist	29	18.02
	Resident	28	17.39
	Senior/Specialist	31	19.26
	Fellow	4	2.50
	Anesthesiologist	4	2.50

5.2. Level of Team work performance.

Operation checklist was used to assess operation room professional's soft skill team work performance. The checklist has four domains with each domain had three element categories for assessing the level of teamwork performance of study participants. To see the level teamwork performances, the mean score of their performance at each team was taken and the team perform above mean score was rated as the team with good teamwork performance, while those score below their mean score were considered as poor teamwork performance.

Accordingly, about one third 56(34.78%) of team has good teamwork performance on gathering information from three elements of situation awareness, while majority 55(34.16%) of the team has good team work performance on coordinating team activities from the three elements communication and teamwork out of total 161 team participated in the study. About three fourth 122(75.78%) of the team had poor teamwork performance on establishing a shared understanding from the three elements of Communication and teamwork**,** while only about 56(34.78%) of the team had good performance on setting and maintaining standards from the three elements of leadership and management. Regarding, major categories, nearly half 74(45.96%) of the study participants has good teamwork performance on communication and teamwork and only about 50(31.06%) of the team had good teamwork performance on Leadership and management out of total team participated on the study (table 2).

Table 2: Level of Teamwork Performance of Operating Room professionals working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

S.N	Variables	Frequency(percentage)	Frequency(percentage)
		Good performance	**Poor performance**
1	**Element Categories**		
	Situation Awareness		
	Gathering information	56(34.78)	105(65.22)
	Understanding information	20(12.48)	141(87.58)
	Projecting and anticipating future state	50(31.06)	111(68.94)
2	**Decision-making**		
	Considering options	11(6.84)	150(93.17)
	Selecting and communicating option	53(32.92)	108(67.08)
	Implementing and reviewing decisions	14(8.70)	147(91.30)
3	**Communication and teamwork**		
	Exchanging information	35(21.74)	126(78.26)
	Establishing a shared understanding	39(24.22)	122(75.78)
	Coordinating team activities	55(34.16)	106(66.84)
4	**Leadership and management**		
	Setting and maintaining standards	56(34.78)	105(65.22)
	Supporting others	53(32.19)	108(67.81)
	Coping with pressure	55(34.16)	106(66.84)
5	**Main Categories**		
	Situation Awareness	28(17.39)	133(82.61)
	Decision-making	51(31.68)	110(68.32)
	Communication and teamwork	74(45.96)	87(54.04)
	Leadership and management	50(31.06)	111(68.94)

5.2.1. Overall Teamwork Performance

To find the overall teamwork performance of operating room professionals, the mean score of each team on main domains namely (Situation Awareness, Decision-making, Communication and teamwork, Leadership and management) was assessed and the team with above mean score performance was considered as good teamwork performance while those score below mean score were considered as poor teamwork performance. Accordingly, the overall good teamwork performance from total 161 teams participated in the study was 40(25.84%), as shown on figure 3.

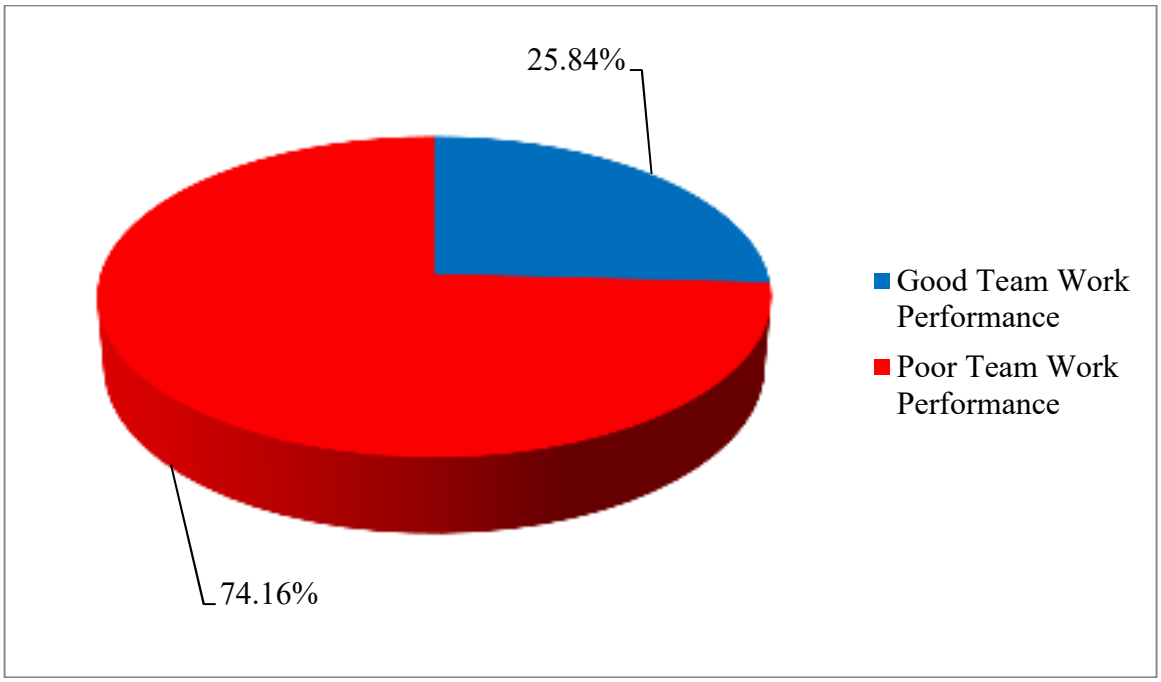


Figure 3: Overall Teamwork Performance of Operating Room professionals working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

5.3. Cause for team work performance

5.3.1. Team related factors

To assess causes for level of teamwork performance among operation room team's self-administered questionnaires was used and mean response per team was computed. Then the teams' interactions and relationship, and attitudes had been assessed separately and majority of occurrence was changed to percentage and displayed (table 3 and 4).

Regarding teams interactions and relationship, teams with majority replied No for item "there is conflict in professional difference within team" were 78(48.45%), with Yes response for item "exchanging information is within smoothly on course of operation" (table 3).

Table 3: Teams interaction and relationship factors for Teamwork Performance of Operating Room team working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

S.N	Characteristic	Frequency	Percentage
1	There is conflict in professional difference within team		
	Yes	83	51.55
	No	78	48.45
2	Team familiarity (No new member within team)		
	Yes	138	85.71
	No	23	14.29
3	Establishing a shared understanding with the team		
	Yes	19	11.80
	No	142	88.20
4	Exchanging information within smoothly on course of operation		
	Yes	59	36.02
	No	102	63.98
5	Coordinated activity within teamwork		
	Yes	58	36.60
	No	103	63.40

Regarding team's attitude towards team work performance again, self-administered questionnaires was used with 1-5 Likert scale then mean score was used to categorize in to positive or negative attitude towards teamwork based on above or below means score within the team (table 4).

Table 4: Staffs Attitude towards Teamwork Performance of Operating Room professionals working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

S.N	Elements	Frequency	Percentage
		Positive attitude	**Negative attitude**
1	Setting and maintaining standards (setting good example) is the culture of your team	83(51.55)	78(48.45)
2	Supporting and motivating others is the culture of your team	103(63.98)	58(36.02)
3	Delegating leadership when necessary (for example, for technical challenge or unstable patient) is the culture of your team	84(52.17)	77(47.83)
4	Exchanging information (tells the team of any difficulties and keeps them informed of how the difficulties are being dealt with) is the culture of your team	103(63.98)	58(36.02)
5	Establishing a shared understanding and clearly and precisely informs the team (plan, background, aim and potential difficulties) is the culture of your team	84(52.17)	77(47.83)
6	Coordinating activities (use of all resources and skills) is the culture of your team	57(35.40	104(64.60)
7	Gathering information(checking information from relevant sources example patient and patient record) before the procedure is the culture of your team	58(36.02)	103(63.98)
8	Understanding information(acting according to the operative findings) is the culture of your team	19(11.80)	142 (88.20)
9	Predicting and thinking ahead (having a contingency plan (a Plan B) is the culture of your team	141(87.58)	20(12.42)
10	Monitoring own performance (knowing the extent of own skills) is the culture of your team	118(73.29)	43(26.71)
11	Considering options (weighs up the risks and benefits of the potential solutions) is the culture of your team	77(47.83)	84(52.17)
12	Selecting and communicating option (allowing the team to comment on the decision) is the culture of your team	142(88.20)	19(11.80)
13	Implementing and reviewing decisions (recognizing when it is necessary to implement Plan B) is the culture of your team	29(18.01)	132(81.99)

To see the overall attitude of team members towards teamwork performance the mean score of 13 items was pooled and those teams with below mean score were rated as positive attitude towards teamwork performance while others were rated as negative attitude. Thus teams with positive attitude were about 84(52.17%) figure 5.

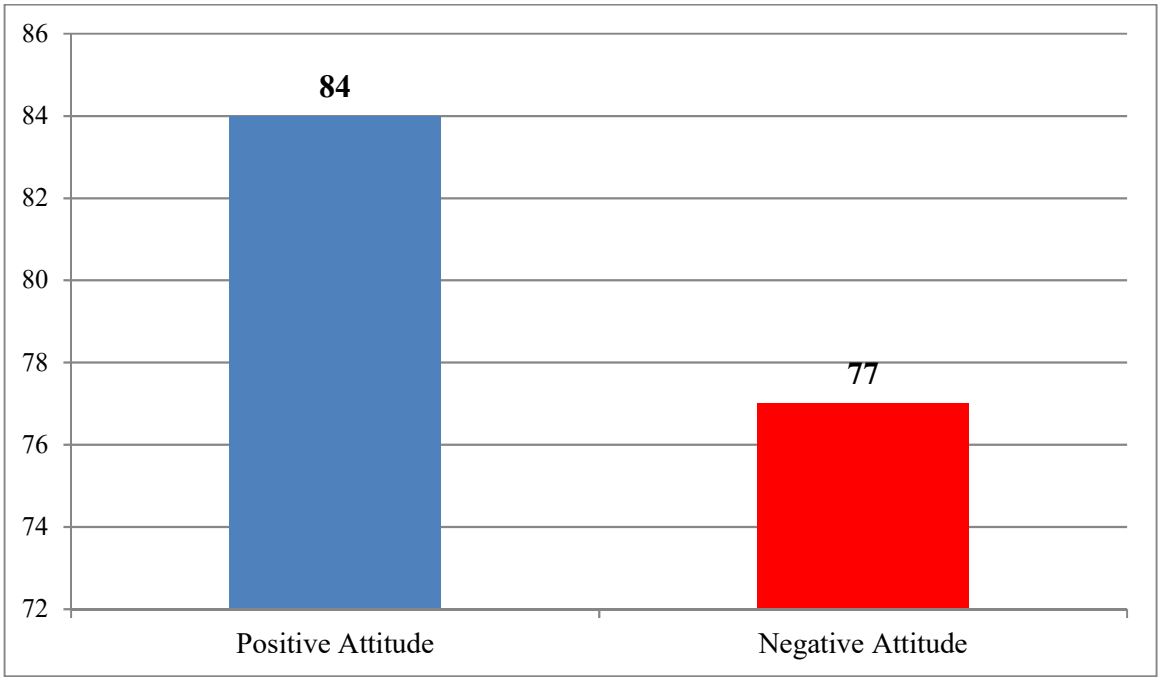


Figure 4: Overall Staffs Attitude towards Teamwork Performance of Operating Room professionals working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

5.3.2. Cases operated related

To identify whether case operated were factors for team work performance, all operated cases by teams were recorded during assessment of team work performance by using observation checklist. Accordingly, about 35(12.75%) cases were complicated case, 25(15.53%) case was head surgery and 104(65.10%) case took >2 hours' duration to complete operation (table 5).

Table 5: Cases operated during assessing teamwork performance of Operating Room professionals working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

S.N	Characteristic	Frequency	Percentage
1	**Case being operated is complicated/sever**		
	Yes	35	12.74
	No	126	87.60
2	**Case being operated is emergency**		
	Yes	21	13.05
	No	140	86.95
3	**Site of operation**		
	Laparotomy	59	36.65
	Neck Surgery	22	13.66
	Head surgery	25	15.53
	Others(specify	55	34.16
4	**Duration of surgery (operation) taken in hrs**		
	<=2 hours	56	34.90
	>2 hours	105	65.10

5.3.3. Hospital Related factors

To assess whether hospital factors were related with teamwork performance among operation room professional's self-administered questionnaires was used and changed to team by computing mean score per responses. Accordingly, teams with majority replied yes for an "item sufficient supplies available to carryout tasks without any interruption due to supplies" were 14(8.70%) while teams with majority replied No for an item "there is workload in work area which creates interruption to carryout tasks were 34(21.12%) table 6.

Table 6: Hospital related factors for teamwork performance of Operating Room professionals working at selected public hospitals in Addis Ababa, Ethiopia, 2023(n=161)

S.N	Characteristic	Frequency	Percentage
1	Sufficient supplies available to carryout tasks without any interruption due to supplies		
	Yes	14	8.70
	No	147	91.30
2	Sufficient devices/equipment's/ available to carryout tasks without any interruption due to devices/equipment's/		
	Yes	89	55.28
	No	72	44.72
3	Sufficient instruments available to carryout tasks without any interruption due to instruments		
	Yes	72	44.72
	No	89	55.28
4	There is workload in work area which creates interruption to carryout tasks		
	Yes	127	77.88
	No	34	21.12

5.4. Predictors of teamwork performance

5.4.1. Socio-demographic factors

In order to identify factors associated with teamwork performance of Operating Room professionals of the study area, binary logistic regression with enter method was used with 95% CI and p value < 5%, and variables candidate to multiple variables logistic regression during bi-variable analysis with p-value less than 0.25 were entered by enter method.

Age, marital status and work experience were identified as factors associated with teamwork performance of participants from socio demographic factors. The odds of 31-40 years professionals was **0.54** times **[(AOR=0.54, p=0.001; 95%CI (0.32, 0.91)]** less to have good teamwork performance than professionals with age group of >40 years. The odds of being married was 0.59 times [(AOR=0.59, p=0.04; 95%CI (0.34, 0.98)] less to have good teamwork performance widows. The odds of professional with <5 years of work experience

were 38% times **[(AOR=0.38, p=0.03; 95%CI (0.16, 0.89)]** less to have good teamwork performance than professionals with **>10years** work experience.

Again, teams' interactions and relationships related factors were also associated with teamwork performance working in the study area. The odds of processionals had team familiarity (No new member within team) was **4** times **[(AOR=3.56, p=0.01; 95%CI (2.51, 3.92)]** higher to have good teamwork performance than their counter parts. The odds of processionals establishing a shared understanding with the team were **2** times **[(AOR=1.87, p=0.01; 95%CI** (**1.12, 3.44)]** higher to have good team work performance than their counter parts. The odds of professionals with negative attitude towards teamwork were **74%** times **[(AOR=0.74, p=0.007; 95%CI** (**0.55, 0.92)]** less to have good team work performance than their counter parts.

Cases being operated factors were also associated with teamwork performance working in the study area. The odds cases being complicated/sever were **3** times **[(AOR=3.16, p=0.004; 95%CI (1.45, 6.90)]** higher to have good teamwork performance than their counter parts. The odds of site of operation were head surgery were **0.33** times **[(AOR=0.33, p=0.001; 95%CI (0.19, 0.56)]** less to have good team work performance that than other site of operation. The odds duration of surgery (operation) taken in >2 hrs were **32%** times **[(AOR=0.32, p=0.006; 95%CI (0.14, 0.72)]** less to have good team work performance than cases taken <=2 hrs.

In addition, hospital related factors were associated with teamwork performance working in the study area. The odds of presence of sufficient supplies available to carryout tasks without any interruption were **2** times **[(AOR=1.5, p=0.004; 95%CI (1.58, 2.15)]** higher to have good teamwork performance than their counter parts. The odds of the presence of workload was **3** times **[(AOR=2.45, p=0.003; 95%CI (2.27, 2.76)]** higher to have good teamwork performance than its counter parts. The odds of presence of teams had training on soft skill were 2 times **[(AOR=1.78, p=0.03; 95%CI (1.53, 1.62)]** higher have good teamwork performances than its absence (Table: 7).

Table 7: Association of selected variables with level of teamwork performance of Operating room professionals at selected public hospitals in Addis Ababa, Ethiopia,2023(n=161)

Variables	Poor Performance	Good Performance	[COR(95%CI)]	P-Value	[AOR(95%CI)]	P-Value
Age						
23-30yrs	28	10	0.50(9.33, 0.76)	0.001	0.6(0.32, 1.10)	0.01
31-40yrs	53	20	0.54(0.38, 0.76)	0.001	0.54 (0.32, 0.91)	0.021*
>40yrs	28	22	1.00		1.00	
Marital status						
single	22	7	1.22(0.21, 0.75)	0.004	1.5(0.58, 4.18)	0.38
Married	90	27	0.48(0.29, 0.81)	0.005	0.59(0.34, 0.98)	0.04*
Widowed	8	7	1.00		1.00	
Work experience						
<5 years	10	9	0.65(0.43, 0.99)	0.04	0.38(0.16, 0.89)	0.03*
5-10 years	29	10	0.56(0.38, 0.83)	0.004	0.74(0.44, 1.27)	0.27
>10 years	60	38	1.00		1.00	
Team familiarity (No new member within team)						
Yes	101	38	1.81(1,12, 2.93)	0.15	3.56(2.51, 3.92)	0.02*
No	19	4	1.00		1.00	
Establishing a shared understanding with the team						
Yes	108	34	1.64(1.01, 3.17)	0.24	1.87(1.12, 3.44)	0.01*
No	13	7	1.00		1.00	
Attitude of Staff						
Negative Attitude	63	21	0.72(0.52, 0.98)	0.04	0.74(0.55, 92)	
Positive Attitude	58	19	1.00		1.00	
Case being operated is complicated/sever						
Yes	108	33	1.76(1.05, 2.56)	0.12	3.16(1.45, 6.90)	0.004*
No	13	7	1.00		1.00	

Site of operation						
Laparotomy	45	11	0.54(0.38, 0.77)	0.001	0.53(0.36, 0.80)	0.002*
Neck Surgery	15	7	0.91(0.58, 1.45)	0.70	0.94(0.59, 1.50)	0.80
Head surgery	20	5	0.34(0.20, 0.57)	0.001	0.33(0.19, 0.56)	0.001*
Others	40	18	1.00		1.00	
Duration of surgery (operation) taken in hrs						
<=2 hours	58	23	0.73(0.46, 0.97)	0.01	0.32(0.14, 0.72)	0.006*
>2 hours	62	18	1.00		1.00	
Sufficient supplies available to carryout tasks without any interruption due to supplies						
Yes	10	4	1.54(1.13, 2.09)	0.006	1.58(1.15, 2.15)	0.004*
No	110	37	1.00		1.00	
Presence of training						
Yes	65	24	2.16(1.30, 3.58)	0.003	1.78(1.53, 1.62)	0.03*
No	55	16	1.00		1.00	
There is workload in work area which creates interruption to carryout tasks						
Yes	95	27	1.54(1.13, 2.09)	0.006	2.45(2.27, 2.76)	0.003*
No	30	8	1.00		1.00	

***Adjusted for all significant variables p <0.05**

COR= Crude odds Ratio

AOR= Adjusted Odds Ratio

6. DISCUSSION

In this study, Operation room teams' level of working performance and related factors were evaluated at selected public hospitals in Addis Ababa. The operating room (OR) is one of the areas of the health care delivery system that requires the most attention because it is a place with a high risk of adverse events (errors) and where patients undergoing surgery incur high costs. Approximately half of these errors could be avoided with good teamwork.

In this study the level of teamwork performance in the dimensions of the main domains ratings, were assessed as situation awareness 28(17.39%), decision-making 51(31.68%), Communication and teamwork 74(45.96%) and that of Leadership 50(31.06%) respectively good teamwork performance. The findings of this study were consistent with the findings of a study conducted in Scotland, which revealed that poor situational awareness, teamwork, leadership, and management abilities were common weaknesses for the team (38). This demonstrated that, as far as aggregated teamwork performance is concerned, low performance on situational awareness, teamwork, leadership, and management abilities in assessing soft skills of operating room professionals resulted in low achievement in overall performance.

Only about one-fourth of the study teams (25.84%) have good overall teamwork performance, according to this study. This study's findings were lower than those of previous studies conducted in America, where good teamwork performance ranged from 70% to 80% (2, 35, 36), in England 73(67.6%) (37), Finland 75(83.3%) (39), Kenya 35% (40). The disparity in socioeconomic status could be the cause of these discrepancies. The lack of materials, tools, and equipment may have contributed to the study's poor teamwork performance results. Another explanation for these differences could be that the study designs were different. Unlike the pre- and post-training studies carried out in America and Finland, this study used an observational methodology. The different study settings could be another reason. In contrast to Kenya, where only one hospital was included in the study, different hospitals were included in this one.

In this study age, marital status and work experience were identified as factors associated with teamwork performance of participants from socio demographic factors. The odds of 31-40

years professionals was 54% times less to have good teamwork performance than professionals with age group of >40 years. The finding of this study was supported by the studies conducted in Netherlands (42) and Japan (16). The reason for this could as age of professional increases the behavioral intelligence for soft skill such as smooth communication, situation awareness, leadership management developed well, which in turn helps in good teamwork performance outcome. This finding contradicts the findings of other studies conducted in the United States, the Netherlands, and Japan, which found no statistically significant relationship between operating room teamwork performance and age as participants' ages decreased ($p>0.05$) (43-45). The possible reason for this might be in this study the number of younger work forces large in number, the same is true in Africa, while in developed countries surgical expertise were older than our country's professionals.

In this study the odds of being married was 59% times less to have good teamwork performance widows. The finding was in line with the study conducted in Iran and Japan (13, 16). The possible reason for this might be married staffs do have double responsibility; family and child care for burden rests on these staffs in addition to hospital tasks such that their teamwork performance was less in compared to those in single widowed state.

In this study the odds of professional with <5years work experience were 38% times less to have good teamwork performance than professionals with >10years work experience. The result of this study was supported by studies conducted in Netherlands and Japan (16, 43). This inferred that as professional become expertise their confidence and clinical judgments increases hence can determine the level of team performance.

Again, in this study teams' interactions and relationships related factors were also associated with teamwork performance. The odds of processionals that had team familiarity (No new member within team) were 4 times higher to have good teamwork performance than their counter parts and the odds of processionals establishing a shared understanding with the team were 2 times higher to have good team work performance than their counter parts. The result of the study was similar with the study reported by systematic review, and study conducted in Australia; as there is familiarity (knowing other team members) and good team sprit have

relation with teamwork performance than unfamiliar team members (49, 51). This deduced that being the teams know each other increases the chance for respect-each other and good team spirit and as a consequence for high-quality teamwork performance.

In this study, the odds of professionals with negative attitude towards teamwork were 74% times less to have good team work performance than their counter parts. The finding was congruent with the study conducted by systematic review and meta-analysis and study conducted in Iran (8, 11, 49). This implied that the affective domain that is attitude of the staffs control the soft skills of surgical team such as communication and team work, Leadership and management, decision-making and situation awareness more than that of technical skill (psychomotor skill).

Again, in this study hospital related factors were associated with teamwork performance. The odds of presence of sufficient supplies available to carryout tasks without any interruption were 2 times higher to have good teamwork performance than their counter parts. Again the odds of the presence of workload were 3 times higher to have good teamwork performance than its counter parts. The result of this study was in line with the study conducted in Kenya and Nigeria (53, 54). The possible reason for this might be shortage of man power, supplies, instruments and medical devices with result in surgical errors, insufficient care and uncontrolled sentinel events which might lead to poor teamwork performances. In contradiction to this the result of this study was disagree with the study conducted in America (55). The possible reason for this difference might be in developed countries like America man power, all medical devices and instruments well equipped in their operation centers, while in developing countries like our country Ethiopia the shortage of supplies is prominent.

Lastly, in this study the odd of presence of training on soft skill was 2 times higher to have good teamwork performance than its absence. The result of this study was supported by the studies conducted in America, UK and Germany (42, 52, 55). This deep-rooted that training program helps in stimulating all the three domains (cognitive, psycho-motor and affective domains) which as a direct function with better team work performance as this experienced in reduction in hospital stay, morbidity and mortality of patients undergoing surgery.

STRENGTH AND LIMITATION OF THE STUDY

Strength of the study

There is no any strength the investigator to raise here. However, trying to answerer the objective of the study as a novice researcher might be seen as strength. Besides, the use of previously validated observation checklist (the Observational Teamwork Assessment for Surgery (OTAS) which increases the quality of data might be seen as strength.

Limitation of the study

As a limitation, this study employed a cross-sectional study design that capture a snapshot of a certain event at a certain point in time. So, causal relationships between dependent and independent variables were not assumed.

In addition inability of supporting the study by qualitative study was the weakness of this study.

Another limitation of this study was that, the study not considered the different categories of health care taskforces support staff (administrative) to examine their imputes on surgical performance were not assessed.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In conclusion, about three forth (75%) of operation room team had poor teamwork performance. Age, marital status and work experience, team familiarity (No new member within team), establishing a shared understanding with the team, attitude towards teamwork, site of operation were head surgery, duration of surgery (operation) taken in >2 hrs, presence of sufficient supplies, presence of training and presence of workload were factors associated with team work performances among operating room teams.

Recommendation

The operating room (OR) is a complex area which mainly need close attention than any other unit of hospital because it is a high-risk setting for adverse events for patients undergoing surgery as well as health care professionals and incurs high costs while such problems could be prevented with effective teamwork. Teamwork performance among operating room professionals is influenced by many individual and organizational related factors.

To protect patients undergoing surgery as well as health care professionals in this study area and elsewhere in the country, first and foremost, guidelines and protocols concerning training on teamwork need to be prioritized to boost soft skills of operating team processionals. Therefore, we strongly recommend the following.

To Ministry of Health, health care planners and Addis Ababa Health Bureau

- ✓ Needed to devise measures to improve operation room professionals' teamwork performance such as training on soft skill (non-technical skills) technology and it inclusion in curriculum for teamwork for subsequent better patient outcomes.

To Respective hospitals

- ✓ Work on measures to improve operation room professionals' teamwork performance by training and working conditions as well as expand their access to medical devices, equipment and supplies and monitor on soft skill. Increased support for operating room professionals by hospital managers might lead to safer surgical procedures and subsequent better patient outcomes.

To Operation room professionals

- ✓ Develop conducive and smooth behavior for implementing ethical conduct of smooth relationship and good communication, and habit implementing standard for their better achievements.

To Researchers

- ✓ Should conduct researches on the same topic and area by taking this result as background data.

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ANNEXES

Annex I: consent form

Dear

As part of the requirements for the Master of Science in Perioperative Cardiothoracic Nursing Degree, I am conducting a study about surgical team performance and associated factors. You are being invited to participate in this research study. Before you make a decision to participate, it is important for you to understand what participation consists of and the purpose of this study.

The purpose of this study is to assess surgical team performance and associated factors among surgical team. In order to attain this study objective your good will and kindly participation is needed. Confidentiality is strictly protected and none of your response will be reported separately. Therefore, there is no need to write your names or ID numbers on these questionnaires. It is your right to participate or to refuse in this study. However, your sincere responses will help us to generate valuable information to attain the purpose of the study. So please take a few minutes to answer to the questions.

If you choose to participate, you may withdraw your participation at any time during the survey. Completion of the survey will serve as your consent to participate. There will be no direct benefits to you for participation in this study. It is my hope that information obtained from this study may be useful to the body of nursing to increase understanding in post op pain management.

If you are willing to participate in this study please put "✓", If not leave it.

I am willing to participate [ ] Signature _____

Annex II: Questionnaire

Name of your department (current department) _____ Questionnaire # _____

Date _____

Time _____

Part I: Socio-demographic information

S.N	Characteristic	Responses
1	Age in year	_____
2	Sex	1. Male 2. Female
3	Marital status	1. single 2. Married 3. Divorced 4. Widowed
4	Work experience (in Years)	_____
5	Unit of Work	1. Major OR 2. Chest OR 3. Orthopedic OR 4. Neurologic OR 5. Gynecologic OR 6. Emergency OR 7. Others (Specify)_____
6	Level of Education	1. Diploma 2. BSc 3. MSc 4. Specialty certificate 5. Others
7	Profession	1. Nurse 2. Anesthetist 3. Resident 4. Fellow 5. Senior/Specialist

		6. Anesthesiologist 7. Others

Part II: Observation checklist to assess teamwork performance

S.N	Category	Category rating	Element	Element rating
1	Situation awareness	1 2 3 4	Gathering information Understanding information Projecting and anticipating future state	Performed Not performed
2	Decision-making	1 2 3 4	Considering options Selecting and communicating option Implementing and reviewing decisions	Performed Not performed
3	Communication and teamwork	1 2 3 4	Exchanging information Establishing a shared understanding Coordinating team activities	Performed Not performed
4	Leadership	1 2 3 4	Setting and maintaining standards Supporting others Coping with pressure	Performed Not performed

∗1= poor; 2 =marginal; 3= acceptable; 4 =good; NA= not applicable.

Poor: performance endangered or potentially endangered patient safety; serious remediation is required.

Marginal: performance indicated cause for concern; considerable improvement is needed.

Acceptable: performance was of a satisfactory standard but could be improved.

Good: performance was of a consistently high standard, enhancing patient safety; it could be used as a positive example for others.

NA: not applicable

Key table to assess team work performance during observation by data collectors

Leadership and management	
Leadership	Involves/reflects on suggestions/visible/accessible/inspires/motivates/coaches
Maintenance of standards	Subscribes to standards/monitors compliance to standards/intervenes if deviation occurs/deviates with team approval/demonstrates desire to achieve high standards
Planning and preparation	Team participation in planning/plan shared/understanding confirmed/projects/changes in consultation
Workload management	Distributes tasks/monitors/reviews/tasks prioritized/allots adequate time/responds to stress
Authority and assertiveness	Advocates position/values team input/takes control/persistent/appropriate assertiveness
Teamwork and cooperation	
Team building/maintaining	Relaxed/supportive/open/inclusive/polite/friendly/use of humor/does not compete
Support of others	Helps others/offers assistance/gives feedback
Understanding team needs	Listens to others/recognizes ability of team/condition of others considered/gives personal feedback
Conflict solving	Keeps calm in conflicts/suggests conflict solutions/concentrates on what is right
Problem-solving and decision-making	
Definition and diagnosis	Uses all resources/analytical decision-making/reviews factors with team
Option generation	Suggests alternative options/asks for options/reviews outcomes/confirms options
Risk assessment	Estimates risks/considers risk in terms of team capabilities/estimates patient outcome
Outcome review	Reviews outcomes/reviews new options/objective, constructive, and timely reviews/makes time for review/seeks feedback from others/conducts post treatment review
Situation awareness	
Notice	Considers all team elements/asks for or shares information/aware of available resources/encourages vigilance/checks and reports changes in team/requests reports/updates
Understand	Knows capabilities/cross-checks above/shares mental models/speaks up when unsure/updates other team members/discusses team constraints
Think ahead	Identifies future problems/discusses contingencies/anticipates requirements

Part III: Team related factors for teamwork performance

S.N	Characteristic	Responses
1	There is conflict in professional difference within team	1. Yes 2. No
2	Team familiarity (No new member within team)	1. Yes 2. No
3	Establishing a shared understanding with the team	3. Yes 1. No
4	Exchanging information within smoothly on course of operation	4. Yes 1. No
5	Coordinated activity within teamwork	5. Yes 1. No

Part IV: Questionnaire to assess attitude of staffs prior to observation checklist

Please put"✓" under your desired responses. 1. Strongly disagree, 2. Disagree, 3. Neutral 4. Agree and 5. Strongly Agree

S.N	Elements	**1**	**2**	**3**	**4**	**5**
1	Setting and maintaining standards (setting good example) is the culture of your team					
2	Supporting and motivating others is the culture of your team					
3	Delegating leadership when necessary (for example, for technical challenge or unstable patient) is the culture of your team					
4	Exchanging information (tells the team of any difficulties and keeps them informed of how the difficulties are being dealt with) is the culture of your team					
5	Establishing a shared understanding and clearly and precisely informs the team (plan, background, aim and potential difficulties) is the culture of your team					
6	Coordinating activities (use of all resources and skills) is the culture of your team					
7	Gathering information(checking information from relevant sources example patient and patient record) before the procedure is the culture of your team					
8	Understanding information(acting according to the operative findings) is the culture of your team					
9	Predicting and thinking ahead (having a contingency plan (a Plan B) is the culture of your team					
10	Monitoring own performance (knowing the extent of own skills) is the culture of your team					
11	Considering options (weighs up the risks and benefits of the potential solutions) is the culture of your team					
12	Selecting and communicating option (allowing the team to comment on the decision) is the culture of your team					
13	Implementing and reviewing decisions (recognizing when it is necessary to implement Plan B) is the culture of your team					

Part V: Case related factors for teamwork performance

S.N	Characteristic	Responses
1	Case being operated is complicated/sever	1. Yes 2. No
2	Case being operated is emergency	1. Yes 2. No
3	Site of operation	1. Laparotomy 2. Neck Surgery 3. Head surgery 4. Others(specify_____)
4	Duration of surgery (operation) taken in hrs	_____

Part VI: Hospital Related factors for teamwork performance

S.N	Characteristic	Responses
1	Is there any training given on non technical skills	1. Yes 2. No
2	Sufficient supplies available to carryout tasks without any interruption due to supplies	1. Yes 2. No
3	Sufficient devices/equipments/ available to carryout tasks without any interruption due to devices/equipments/	1. Yes 2. No
4	Sufficient instruments available to carryout tasks without any interruption due to instruments	1. Yes 2. No
5	There is workload in work area which creates interruption to carryout tasks	1. Yes 2. No