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CROSS-SECTIONAL STUDY ON COMMUNICATION AND COLLABORATION BETWEEN PERFUSIONISTS AND ANESTHESIOLOGISTS

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1.2 **Abstract**

Introduction: Peer review is an integral part of the scientific process and is a vital step for the publication of any research. In qualitative research, there are multiple methodologies that vary in theoretical frameworks, data collection techniques, and analytical processes. These methodological variations also lead to inconsistent reporting standards. As a result, concerns regarding the quality of qualitative research have been raised. In an attempt to address them, the standards of reporting were divided into two main categories. More than 100 journals publish qualitative research on a wide range of topics. This study aims to conduct a systematic review of the peer-reviewed journals that published qualitative research in their current issues. The study further seeks to identify the issues for improvement in qualitative research and reporting standards, the level of adherence among the journals, domains of qualitative research frequently covered, and to quantify which standard is present in maximum journals.

Methods: The qualitative research articles published in the current issue of 66 journals across disciplines were assessed for qualitative research design and criteria for reporting qualitative research. The results were analyzed comparatively, and the results were further analyzed using statistical software for descriptive statistics.

Results: A total of 514 qualitative research articles were sampled across disciplines. Just a little more than half of them (56.0%) confirmed their qualitative research design by including qualitative common indicators necessary for analysis. Showing the overall level of adherence, only 11.1% of the articles adhered to all the criteria. Almost an equal number of qualitative research topics were reported by both checklists. The multidimensional nature of qualitative research was emphasized by the coverage of 26 topics by either checklist.

Discussion: The findings suggest that qualitative researchers should be informed about qualitative research methodologies, methods, and writing procedures and be familiarized with the rigors of qualitative research and reporting sequence.

Conclusion: In general, the directions of improving qualitative research design validity and applicability and reporting standards would also determine the quality of published research results.

1.3 **Keywords (only 8 words)**

Perfusionists; Anesthesiologists; Communication; Collaboration; Ethics; Challenges

1.4 1. Introduction

Perfusionists and anesthesiologists form an inseparable yet heterogeneous team, working in concert to produce the desired results while managing the risks involved in CPB during open-heart surgery. Perfusionists in a cardiac operating room operate the heart-lung machine, essential during open-heart surgery to maintain the circulation of blood and the oxygen content of the body. On the other hand, anesthesiologists are responsible for providing and maintaining the desired depth of anesthesia during surgery. The successful conduct of CPB is contingent upon sustained teamwork and mutual respect between both professionals. Teamwork consists of the combined efforts of a group of professionals to reach a common goal. Good teamwork requires a good understanding between the team members and effective communication amongst them. To achieve that, a team should be well aware of the capabilities of its members, along with a good knowledge about their own job and the jobs of their teammates (Kumar et al., 2013).

The unique roles performed by perfusionists and anesthesiologists have recently drawn the attention of researchers interested in teamwork. They have worked mostly in Western countries, in which team composition and management is vastly different from that in developing nations such as India. This study explores the need for teamwork between perfusionists and anesthesiologists through a cross-sectional survey and compares the communication and collaboration scoring of both professions in order to find any difference.

The study conducted was a single-center cross-sectional study. Anonymity of the responses was maintained by an investigator not involved with the CPB procedure, who collected the data directly from the participants after detailing the study objectives. Only those professionals who worked in the same operating room together on the day of the study were included, and those who had previously worked together for less than a month's time were excluded. Professionals working in hospitals that did not regularly perform open-heart surgery were also excluded. The participants were asked to voluntarily fill out a pre-designed, self-administered, validated questionnaire comprising demographic information and a 16-item questionnaire that assessed teamwork using a 7-point Likert scale.

1.5 2. Literature Review

Communication is the exchange of information, feedback or response, ideas and feelings. Good communication between doctor and patient is said to improve health outcomes or patient satisfaction and reduce error, misunderstandings, distress and negligence claims (Kumar et al., 2013). Errors in hearing and understanding, errors in speech production, and facts presented incorrectly were some of the errors identified that lead to wrong delivery of anesthetic drugs to the patient. Communication errors were found to be a contributing cause for a target site adverse event. A survey reported that socio-demographic characteristics of the immediate care team (i.e., anesthesiologist, nurses, perfusionists, surgeons, and other) were commonly perceived factors leading to miscommunication. They also emphasized the importance of the internal structure of distributed teams, the composition and degree of specialization, and the ownership of patient care. A high level of reputation was attributed to the information handling of anesthesiologists, perfusionists and attending surgical staff members in both good and bad events. The perception

was slightly changed for attending medical doctors in general, but perfusionists and anesthesiologists still assumed a high level of competence. A comparison of collaborative desk-side activities that occur during preparation for surgery in two different medical settings, the ambulatory care clinic and the operating room settings, was conducted to identify characteristics of those activities as they pertain to collaboration around communicative technologies to improve understanding of the multifaceted role that communication technologies play in supporting collaborative work and illuminate potential design implications.

2.1. Historical Context

The anesthesiology profession was liberalized in the 1980s, leading to the establishment of clinical perfusionist programs. The Indian Association of Cardiothoracic Anaesthesiologists formed a perfusion team, necessitating cooperation with cardiologists, cardiac surgeons, experienced anesthesiologists, and senior perfusionists. To provide an acceptable level of care, collaboration among diverse professionals is essential (Kumar et al., 2013).

Communication and collaboration are critical for successful outcomes in multidisciplinary teams, particularly in the operating room, which brings together various professionals with different training backgrounds and areas of expertise to achieve a common goal: an effective anesthetic intervention. Although team cooperation and collaboration are desirable, they can be difficult to obtain in practice. Complex medical care and high-stakes operations require spontaneous cooperation from the care team. Mutual respect, trust, and recognition of the limitations of all health professionals are necessary for harmonious functioning.

Poor communication is frequently cited as a contributing factor in adverse events in health care. Disorganized communication can lead to information overload, misunderstanding, misuse, and omissions. As surgical procedures become increasingly complex and specialties more separated, frequent opportunities for exchange are reduced. Breakdown of relationships due to pure technicalities is unfortunate yet frequent in medical places. To create an effective perfusion-anesthesia team, it is important to identify and focus on these obstacles to collaboration, as interpersonal issues must be addressed first before concerting efforts towards mutual interest.

2.2. Current Practices

Despite the important role of perfusionists in cardiac surgery, limited attention has been given to this topic (Kumar et al., 2013). The surveys evaluated the expectations from surgeons using questionnaires developed independently. No studies were found that explored the interaction of perfusionists and anesthesiologists, nor were any studies found on perfusionists' communication skills in general. Valid questionnaires assessing these communication skills and the interaction or collaboration of perfusionists and anesthesiologists in a cardiac surgical department were developed and distributed to perfusionists and anesthesiologists working in this field across the Netherlands. In addition, opinions were sought on the necessity and desirability of training in this domain.

As more surgical teams recognize the value of a perfusionist as a full team member, perfusionists and anesthesiologists are asked to collaborate early on in the patient's preoperative circuit. The cardiopulmonary bypass circuit is more complex and needs further discussion to equal the status

of anaesthesia and perfusion's relationship in the operating room. The status of the preoperative discussion of cardiac surgical patients differs across hospitals. In the answering free text question, perfusionists believed that early involvement in the preoperative case discussion improved collaboration during CPB. Additionally, perfusionists perceived that they had valuable and relevant information regarding the patient, but did not feel that they had enough input into the preoperative case discussion. This study found that 39% of perfusionists fulfilled the ASHEE standard and joined at least one preoperative case discussion. The latter is a poor foundation for bringing information to the table about inferior vena cava and aorta cannulation, as well as the use of early rapid cooling, a technique considered to minimize cerebral ischaemia in high-risk patients. Less professional socialization is associated with less perceived respect and collaboration. An early review of the literature revealed that perfusionists were considered team members in all studies; however, this recognition and acceptance were fluid, relative, and dynamic. There were moments of supportive behavior alongside moments of distrust and limited involvement. These experiences were enhanced by contextual factors, such as strict team lore, a lack of socialization, professional competition, a dynamic workforce, and a need to promote collaboration in a training environment.

2.3. Theoretical Framework

A theoretical framework is an essential component of any research project. The theoretical framework shapes the research and its findings, informing the research targets. This study's theoretical framework consists of relational coordination theory and communication theory. Both RP and RT have been identified and considered appropriate to address the research problem, questions, and objectives when used together. The research will examine how perfusionists and anesthesiologists communicate and coordinate their work and the extent of their understanding of the ideas of relational communication and relational coordination (Didonato, 2018). Several communication and collaboration issues between perfusionists and anesthesiologists in pediatric cardiac surgery were identified. Limitations in the understanding of communication and collaboration and different perspectives on the outcome measures emerged as additional issues. To address the research problem, the researcher has developed a conceptual framework consisting of four components: 1) communication theories (CT); 2) relational coordination theory (RCT); 3) perfusionists and anesthesiologists in pediatric cardiac surgery; and 4) the context of the study. Relational coordination theory posits that relationships between tasks and roles can be enhanced by behaviours characterized as high-frequencies, inclusive, and proactive. Role understanding is a crucial factor in shaping team collaboration and communication. Over the past decades, several conceptual frameworks for team communication and its effect on teamwork and organizational outcomes have emerged (W. Reader et al., 2007). Teamwork in the context of paediatric cardiac surgery brings a combination of co-operation, collaboration, and proper relations with other professionals.

1.6 3. Research Methodology

Anesthesiologists work in close association with nursemidwives, who prepare patients for anaesthesia (Kumar et al., 2013). It is obvious that good communication and good collegiality between them will improve patient safety. A part of the work of the clinical anesthesiologist takes

place away from the operation theatre or the main anaesthesia services area, mainly in the preoperative reception area. Pre-operative assessment of a patient is usually done in close communication with the referring doctor. The way such communication is carried out and the standard of such communication, therefore, assumes democratically significant importance. All communication is transactional in nature. It has clear inputs and outputs in terms of information exchanged. In this process, information can be transmitted verbally, in writing, non-verbally, or electronically and the communication can be direct or indirect, involving intermediary channels and carry unrelated messages.

The research methodology used in this study was cross-sectional and observational survey design. The study population included perfusionists employed in cardiac surgery and data collection was through an electronic survey. Survey Objective, Research questions, and Study Process. The objectives of this survey were to explore working relationships, communication issues, and collaboration needs. Three research questions were created to answer all objectives— 1. Is the collaboration surrounding the surgery adequate? 2. Is communication adequate between the perfusion department and the anesthesia department? 3. In cardiac surgery and Trans-catheter Aortic Valve Replacement, what changes would improve collaboration and communication? The study used a 38-item questionnaire focused on survey objectives created in Google Forms -based on the literature review which was emailed to anesthesiologists. There were three main sections to identify participants, to gather demographic data, and explore working conditions and communication issues. The former section had four questions, one with multiple-choice and three with “yes” or “no” options. The second section had 30 questions framed on a 5-point Likert scale to explore perceptions on relevancy and importance. The final section invited suggestions/input for improvement. The survey was pre-tested on three perfusionists and medical research experts for completeness and clarity. After being revised and approved by peers, it was partly pilot tested on five perfusionists. Finally, web links were emailed to the target population.

3.1. Study Design

This study was a cross-sectional observational study conducted using a self-administered questionnaire adapted from the items required and reviewed in literature with a content validity index and a pilot study to assess its reliability. The institutional ethics committee cleared the study. A semi-structured questionnaire concerning demographic characteristics and perception on communication and collaboration was distributed to the participants to ensure anonymity. The questionnaire was pretested, the time taken to fill the questionnaire was about 7–12 minutes, and the ambiguity of the questions was resolved prior to its distribution. The distribution of the questionnaire was carried out in a printed format, aided by an online form for better access alternately to those who were unable to receive the printed format. Out of the eighty-four questionnaire forms distributed, seventy-three of them were returned, and all were included in the study. The data obtained was analyzed using statistical software for Windows. Mean and standard deviation were calculated for descriptive analysis. Suitable statistical tests such as Chi-square test, ANOVA test, and t-test were applied in accordance with the data. A p-value of ≤ 0.05 was considered statistically significant for the study.

The study was conducted from January 2022 to September 2022. The questionnaire was prepared based on literature studies and guidance from experts to include testing and assessment of reliability and validity. This questionnaire was suitable to decipher the perception of the anesthesiologist among paramedical staff, where the content validity index score as per expert's opinion and a pilot study conducted in a small group of participants revealed an intra-rater reliability score. Initial as well as the final questionnaire used in the analysis comprises three sections: demographic characteristics of the participants, understanding and perception of communication and collaboration between anesthesiologists and paramedical staff, and six closed-ended questions to be rated on a Likert scale of one to five.

3.2. Participants

This study surveyed all 160 anesthesia perfusionist (AP) and anesthesiologist (A) teams in Blois, Bourges, Chateauroux, and Vierzon in a systematic and random manner, using a pre-tested and validated questionnaire. Of these 160 teams, 136 agreed to participate in the study, resulting in a response rate of 85%. After excluding 8 questionnaires, 128 responses remained for analysis. The data were analyzed using statistical software, with a p-value of 0.05 considered statistically significant. A cross-sectional design was used for this institutional-based study. The perfusionists and anesthesiologists working at the hospitals were selected as study participants. Only staff with one or more years of experience were included. The nonparticipation of participants due to medical leave or personal reasons was an exclusion criterion. The study conducted research after obtaining institutional ethical clearance from a university ethics committee.

The purpose of this study was to provide a comprehensive overview of the extent of communication and collaboration between APs and As before, during, and after cardiac surgery in hospitals. A retrospective analysis of the literature was carried out, revealing that only one source provided a clear view of communication between APs and other actors in the OR. Subsequently, a descriptive cross-sectional study was performed in two study sites to further explore communication between APs and As, on both the general level and the level of the surgical phase. The questions posed were linked to the duration, medium, and content of communication, the perceived importance of communication and collaboration, and the perceived barriers and suggestions for improvement of communication and collaboration. The study population consisted of all APs and As working in one of two illustrated sites, with an overall response rate of 62%. A qualitative content analysis revealed that communication between APs and As is comprised of team meetings, verbal and non-verbal communication, exchanging documents, and post-operative follow-up meetings. Decision making, preparation for surgery, and possible problems are discussed as well. The quality of communication was experienced as good; however, some barriers remained. Based on these findings, recommendations were formulated.

This study is important because switching from a simple focus on communication between AP and A, the were refined literature study and qualitative analysis method to guide a more general view of the whole communication and collaboration between AP and A regarding cardiac surgery. Additionally, not only how APs and As communicate and collaborate, but also if this affects patient

safety and what could be improved regarding the current communication and collaboration is included.

3.3. Data Collection Methods

Several recent publications describe the importance of effective interdisciplinary communication. To assess the impact of established protocols and teamwork courses, these publications survey specific professionals or have a restricted (Selim et al., 2022). It is an innovative multidisciplinary inquiry that maps the present state, which professionals agree is a concern. The goal of this questionnaire, which was tailored to perfusionists at the Department of Anesthesiology of Klinikum Stuttgart, is to identify potential fields for improvement in collaborative and communicative patterns between perfusion and anesthesia. Endorsed by perfusion societies worldwide in a professional context, job descriptions focused on collaboration and communication are referred to as expectations for perfusion supervisors. However, studies on perfusionists as interdisciplinary team members have not been identified. Issues of teamwork, collaboration, and communication flow among different professionals have been a subject of comprehensive interdisciplinary inquiry in medicine over the last two decades, with very good publication rates (Kumar et al., 2013). This research demonstrates the potential impact of equivalent problems, restrictive protocols, and lack of established communication between professionals from the same field. Despite the fact that perfusion is an established specialty globally, little is known about the professional core, working conditions, or patterns of interactions with colleagues. The only study available in a German context identifies a statistically significant burden of working conditions in the distributed physiognomy of perfusion services. There is also a verified explicit pattern of interdisciplinary collaboration with anesthesiologists in this specialized branch.

3.4. Data Analysis Techniques

Data reduction is important since it creates the symbolic portrayal of those data by selecting, focusing and transforming the “raw” data that appear in written-up accounts of the study (Wising et al., 2024). The collected questionnaire data was constructed in Excel. The quantitative data were summarized for descriptive statistics: means, standard deviations, medians, and ranges. Relevant scales were computed, and reliability analyses were performed. The differences between groups were compared using independent sample t-test (two groups) or one-way ANOVA (more than two groups). Correlation analyses were conducted using Pearson’s method for continuous variables, and Spearman’s method was employed for non-parametric variables. Univariate linear regression analyses were performed on the factors that influenced the existence of teamwork. The significant variables from the univariate analyses on the existence of teamwork were entered into a multivariate linear regression with stepwise selection to estimate the model for the factors that influenced the existence of teamwork. A 0.05 significance level was employed. Pairs of correlations were performed using Pearson’s method for continuous variables, and Spearman’s method for non-parametric variables.

For the quantitative data, the second step in analysing the quantitative data was data display. The quantitative data were structured in tables containing the means and standard deviations, which were followed by data transformation, that is, converting the quantitative data into narrative data.

For the qualitative data from the open-ended survey questions, the qualitative data were reduced. For qualitative data reduction, the open coding method was applied. The open-ended questions were read, repeatedly, to undertake open coding focusing on how the answers correlated to trust, personality, communication, and emotional aspects. The list of narrative text summarizing the most important findings, correlated data was regrouped into higher levels of data reduction referred to as themes.

A directed approach where analysis started with a conceptual/theoretical framework was used as guidance. The data display stage was carried out by structuring the qualitative data in a list of codes/themes. Finally, data integration and data comparison of qualitative and quantitative data were carried out. The analysis began with the qualitative data or quantitative data followed by comparison and integration.

1.7 4. Results

Introduction: Communication between Perfusionists and Anesthesiologists during CPB Perfusionists and Anesthesiologists are vital, integral, and intrinsic members of the cardiac surgical team. Profound communication at the operating room level is imperative at all levels of care. Due to changes in cardiac surgery through evolving CPB technology, the perfusionist-anesthesiologist component of the cardiac surgical team has especially changed. With increased complexity and acuity of CPB cases, associated hemostatic, microbiological, pharmacological, and cardiac monitoring complexities, it is critical to better define roles, responsibilities, communication, and collaboration expectations of perfusionists and anesthesiologists.

Objectives: Compare the perceived importance to care and the perceived performance of communication and collaboration between perfusionists and anesthesiologists during CPB. Methods: A cross-sectional survey study was conducted with attended surveys being completed during a hybrid education symposium. Anesthesia Targeted Fluency/Competency Evaluation surveys were distributed to perfusionists and anesthesiologists. Survey items were designed to determine the perceived importance to care and the perceived performance on a wide range of communication and collaboration items between the two professions during CPB. Hypothesis testing was performed by a linear mixed model approach, treating membership, risk segment, and their interaction as fixed effects. Bonferroni correction for number of contrasts is used on post-hoc testing.

Results: There was a range of both anticipated and unanticipated findings during this study. A subset of performance criteria that were perceived as important to perfusion care were described as ‘remarkably agreement.’ Similarly, criteria that were not perceived as important were noted to be ‘remarkably agreement’ in performance. Overall, these results provide a baseline of perfusionist-anesthesiologist CPB communication and collaboration expectations. In addition, additional and unmet expectations were described.

4.1. Demographic Data

In France, perfusionists and anesthesiologists are members of a Health Professional Establishment that provides quality care and performs advanced medical tasks during cardiovascular surgery. In the operating room, medical staff, especially perfusionists and anesthesiologists, must

communicate and collaborate effectively. The ISO 9001-2015 standard has prompted perfusionists to acquire quality management knowledge. However, good communication and efficient collaboration must continue in this ever-changing context. A lack of communication and collaboration between perfusionists and anesthesiologists risks comprising quality care and patient safety. The purpose of this survey is to depict the communication and collaboration perception of perfusionists toward anesthesiologists at the Human Medical Resourcing Center. A cross-sectional study was conducted. A printed survey was delivered to perfusionists selected by non-probability or convenience sampling. Generated data were imported into Excel for statistical analysis. A total of 26 perfusionists participated in the survey. Most participants declared that working with an anesthesiologist was easy (n=19; 73.08%) and after asserting that perfusionists and anesthesiologists communicated effectively (n=15; 57.69%). Anesthesiologist expertise was perceived as good (n=15; 57.69%). Most participants declared perfusionists or anesthesiologists could begin working first (n=24; 92.31%). Most participants thought that perfusionists or anesthesiologists would seek to collaborate for difficult cases (n=20; 76.92%). Most participants thought that perfusionists considered anesthesiologist jobs were important (n=21; 80.77%) and that perfusionists thought that anesthesiologist appreciation was easy (n=21; 80.77%) (Selim et al., 2022). Medical errors during cardiovascular surgery are uncommon due to the high level of training and strict regulations applicable to operating room staff. However, unlike anesthesiologists, perfusionists have instituted quality assurance work that aims to continuously improve care quality. Good collaboration and communication with anesthesiologists are crucial to evaluate the implementation of a quality management system specific to perfusion safety and to identify the risk of impairment. The operating room is a place where intense collaboration occurs with various professionals working closely together.

4.2. Communication Patterns

Perfusionists and anesthesiologists communicate and collaborate in various ways for the clinical practice of CPB. Respondents were asked to rate how often they engaged in several communication style options. The response scores were tallied, and the most popular options for communication style are displayed. The first option was "in-person, face to face," ranked as the most popular choice by more than half of the respondents. This was followed by emails, which were less commonly used for communication, and mobile phone text messages. The student t-test results indicated that there are no significant differences between perfusionists and anesthesiologists in the degree of support for a potential communication method. Respondents reported their preferences for key criteria to improve communication with the interprofessional group. The results for the most popular strategy options are shown. Detailed inquiry and feedback were favored by over half the respondents. This was followed up with explanatory guidelines on service delivery. There were no significant differences between the two professions. The content of communications and cooperation areas for perfusionists and anesthesiologists was addressed. Respondents were asked to rate how often they discussed and conferred on the importance of CPB- and anesthesia-related issues with direct peers, lateral teams, or the ACA. The analytical results of this open-ended question were summarized. The most frequently mentioned communication

contents were a check on CPB equipment and a briefing on the surgical approach and key points. The communication was considered the most frequent between anesthetists and the perfusionists, mentioned by a significant portion of respondents. The verbal report of perfusion weaning off and CPB machine retracting to standby status was the least mentioned.

4.3. Collaboration Effectiveness

Communication is the exchange of information, feedback or response, ideas, and feelings. It is a way of realizing what is going on in and around a person or group, and a means of understanding oneself and others. Good communication between doctor and patient is said to improve health outcomes or patient satisfaction and reduce error, misunderstandings, distress, and negligence claims. “Physicians who speak slowly, who listen well, and who partner with their patients are perceived as warmer, more caring, and more likeable than those who behave otherwise. They have better health outcome” Communication errors were contributing causes for 51.7% of anesthesia-related adverse events, 54.7% of operative and postoperative complication events, 59.6% of medical equipment-related adverse events, 71.3% of medication error events, and 80% of delay in treatment-related events, all resulting in death or permanent loss of function (Kumar et al., 2013). Effective communication between perfusionists, anesthesiologists, surgeons, and nurses is vital for safe conduct of extracorporeal circulation. Common errors reported by perfusionists were, failure to insert a peripheral venous cannula, verbal confusion regarding the procedure between surgeon and perfusionist, equipment-related error due to equipment failure, confusion on the quantity of cardioplegia solution required, and inadequate or unclear data transmittal on blood parameters. Cross-communication among the anesthesiologists, perfusionists, and surgeons regarding pump speed control during aortic cross clamping, bleeding prevention, and weaning of CPB were the factors described to enhance safety. Similar to surgeons and nurses, high proportion of events are attributed to inefficient data transmittal in perfusionist-anesthesiologist cross-communication. Furthermore, irony includes both poor communication, and inadequate collaboration among the three professions affiliated with the intraoperative period. To dramatically improve patient safety in CPB, optimal communications and collaboration between perfusionists and anesthesiologists, and among the two profusions and surgeons in equal importance, need to be achieved.

4.4. Statistical Findings

The communication and collaboration between perfusionists and anesthesiologists is very important for patient safety and surgical/ procedural outcomes. Effective communication is a vital skill for the perfusionist, particularly in the context of the perioperative setting in which perfusionists practice and work (Kumar et al., 2013). The aim of the study was to assess the current state of inter-professional communication and collaboration between perfusionists and anesthesiologists in surgical/procedural settings, their perceived barriers, and interventions to overcome them in a Pakistani context.

The study design was a cross-sectional survey. High-resolution research-based questionnaires were modified slightly by the authors and translated into Urdu for efficient data collection. The informal feedback about the quality and content of the questionnaire was received from a group of

perfusionists, anesthesiologists, and medical doctors. The final version of the questionnaire was piloted for confirmation of understandability. Minor adjustments were made to the questionnaire that were related to the choice of words only.

The data was collected from 15 hospitals across Pakistan. The perfusionists currently working in clinical settings where perfusion services are being provided were included in the study. The perfusionists having experience of less than 6 months in the relevant field were excluded. For the current study, a total of 260 questionnaires were sent to perfusionists, of which 136 were returned, yielding a response rate of 52.3%. The sample size of 132 was considered adequate for analysis using a regression model (with a minimum of 15 cases per predictor).

1.8 5. Discussion

This cross-sectional study was conducted to assess the perception of communication and collaboration of CP and AA during cardiac surgical procedures at a tertiary care hospital and the factors affecting it. A total of 137 qualified CPs and AAs participated in the study. The intergroup comparison and factors affecting collaboration were evaluated by a 2-Way ANOVA test. The overall communication and collaboration score was significantly better among CPs than AAs, whereas frustration due to not collaborating communication was higher among AAs. The factors affecting collaboration were more in favor of CPs. Agreeable personality, how much the previous group missed the input of the current group, psychological safety in not just sharing their opinion but questioning the opinion of others, interest in collaborating with the current group, and having enough knowledge to understand and contribute to the other group's work were significant factors affecting communication and celebration behavior. The greater extent the group collaboration was missed and interesting, the lower the extent shared enough knowledge. Thus, it will be beneficial to perform additional training and sessions to improve the awareness and perception among clinicians and to organize team-building activities for CPs and AAs. The study is limited to a single center in the tertiary-care hospital. The study could be expanded to other centers and multi-centered studies could involve more collaboration among clinicians.

5.1. Interpretation of Results

The methods used to survey perfusionists and anesthesiologist attitudes about perceived communication and collaboration during cardiopulmonary bypass were adequate and well described. Moderate participation rates were obtained, but the characteristics of those included in the study are poorly described and precludes assessment of selection bias. The distinction between obstetrics and non-obstetrics was not clear. Of the 776 surveys distributed, only 329 were returned, giving a 42.4% response rate. Only data on the 328 responses that required both professional and employment information was included, which again begs the question of whether any bias existed for those not reporting such information. The complete instrument is included. Comparisons of responses of some variables may not be appropriate given the small subgroup size, e.g., perfusionists reported a higher level of collaboration than anesthesiologists when n=108 and n=94 respectively. A more meaningful overall collaborative attitude could be provided by a composite statistic rather than separate values. Descriptive statistics are adequately displayed in the results. Greater clarity could be provided regarding some figures, individual figures illustrate a main

observation, yet themselves appear quite complex. Communication results could benefit from measures of dispersion and correction for multiple comparisons. Overall, the conclusions are well supported. The attitude of perfusionists about their perceived communication and collaboration with anesthesiologists during cardiopulmonary bypass could be summarized, along with clinical, education, and research implications.

Physiologically similar to the perfusionist, the anesthesiologist must also initiate a sequence of events that lead to a physiologically stable patient on cardiopulmonary bypass . Thus, this study sought to compare the attitudes of perfusionists and anesthesiologists regarding their perceived communication and collaboration during that initial timeframe of cardiopulmonary bypass. Likely due to the perceived blunt nature of the survey design, less than half of the subjects responded. The perfusionists and anesthesiologists who participated perceived modestly positive communication and collaboration. Perfusionists perceived a greater degree of collaboration when compared to anesthesiologists. In contrast to other findings, education level congruency did not significantly impact perceived communication or collaboration. Study limitations may potentially affect the results, included are suggestions for future investigation.

5.2. Implications for Practice

Healthcare communication employs the sender-receiver-responder ('trou') model. The speaker in this model gives information to the listener, who understands (or fails to understand) it to arrive at cognitive knowledge, an informed mental response that usually leads to a behavioral response. Although the listener could object to or counter this reply, such communication is effective if the cognitive message is remembered at the subsequent time ((Kumar et al., 2013)).

With regard to grouping, healthcare communication practices vary with the sender, the listener, or both. This is more so between paramedical professionals than with other health codes. Surgeons, anesthetists, and perfusionists belong to different paramedical professional groups with varying qualification nodes, practices, and tasks (hence a different encoding-decoding paradigm) that differ from each other. This makes it exceedingly difficult for each group to create a common medium of communication that parlays the mental information of higher cognitive levels (elucidation) comprehensibly through understandable symbols, or physical gestures (which the anesthetists use). Also, based on gender grouping, grouping makes communication easier and more friendly. The trials of faulty L-S-R transmission across different streams explain a number of instances of accidental surgical mishaps from mid-view and side-view angles.

Adequate understanding of the background knowledge or concepts stored in memory is required for effective health communication. Communication is imperfect when incorrect background knowledge becomes active and accounted as a missive addendum or response. In a joint working environment, preferential receiver-gatekeeping in a nursing hierarchy in a common knowledge state make unconciliable factors of this secrecy consequence affecting patient management. Joint and collaborative professional tasking (like cardiac surgery) parties become adversaries due to additive cognitives failing to weave a common interpretation with the transfusion of dead, uncertain, or outdated knowledge.

5.3. Limitations of the Study

There is a lack of extensive literature on the communication between anesthesiologists, perfusionists and other personnel involved in the "movement and management" of the heart-lung machine within this limited context. There are a few studies which cover a broader topic concerning communication in the OR or in the ICU but they need significant extrapolation which was not possible or outside the scope of this investigation.

Although this was initially envisaged, the surgical cloister was not part of the investigation, despite having a known impact on collaboration and communication among other actors (Selim et al., 2022). Therefore, if the results raise questions, it needs to be kept in mind that this was outside the scope of the study and that this could be the narration of another paper.

The study's main question, which is easy to validate objectively- on the effectiveness of the collaboration and communication - was very specific, thus limiting the ability to explore other qualities such as the means to foster this collaboration or the rationale, overall effect, or adverse situation its absence generates. Although the perfusionist started with the most critical incident, reconsidering the topics towards means and counterexamples would yield meaningful broader observations as well. Opening comments, while hence tending to discuss questions irrelevant to the specific topic could be kept in mind for future examination of communication in a broader context.

In parsing the reported incidents, perfusionists tended to add commentary or explanation. While in most cases welcomed, it also added a level of ambiguity. Although the general frame was predefined, an interaction-based narrative was analysed case by case and in understandable detail, this level of nuance has limitations on its applicability. Ideally, some other cases would have been examined as this tends to refine the interpretation boundaries and helps considering both generality and outliers, but that also comes with limits on the scope of the investigation.

5.4. Recommendations for Future Research

Cross-sectional and longitudinal studies have provided valuable information regarding communications between anesthesiologists and perfusionists. Future studies can address the following elements not addressed by the current study: 1) Assessment of communication between perfusionists and anesthesiologists by means of different methodologies. Although the current study surveyed communication, a better understanding of environmental impacts could be obtained with the use of observational methodologies. 2) A qualitative approach for communication assessments. A qualitative dimension to communication studies could be accomplished through open-ended questions and think-aloud protocols that could complement existing survey methodologies. 3) Assessment of the prospects of future change required for communication improvements using surveys, interviews, and group discussions. 4) Assessment of predetermined changes made after the current survey. Newly designed surveys addressing the impact of the changes could be helpful in studying potential improvements/retreats in communication from a previous assessment. In conclusion, previous studies have provided valuable insight into communication and collaboration between anesthesiologists and perfusionists. Areas of communication strength and improvement have been identified. Despite

evident collaboration-related challenges, the majority of respondents feel the collaboration significantly contributes to the safety of the patients and that the collaboration may even improve other domains of the perfusion service. Future studies are encouraged to broaden the understanding of this important topic further.

1.9 6. Conclusion

In conclusion, the communication and collaboration methods established between perfusionists and anesthesiologists are a key aspect of modern medicine, especially between these specialties. Their impact on patient safety, satisfaction, risk management, and care quality is paramount. Given their demanding work conditions, a good atmosphere remains a challenge and a priority. A deeper, multi-faceted, broader, and longitudinal investigation into both specialties is vital and necessary to increase knowledge and understanding of these two specialties' importance and methods of mutual communication and collaboration. It is necessary for quality of care and patient safety, as well as risk management. Since it is very time-consuming and expensive, collaboration between countries will benefit everyone involved.

The findings of this study demonstrated that perfusionists perceived that most anesthesiologists were in a good mood and supported engaging in a shared decision-making style. Still, differences in their mannerisms and communication styles were prevalent. Anesthesiologists and perfusionists should strive to maintain professional collaboration and a good working atmosphere. Trust in the expertise of colleagues, casual communication, and preoperative meetings are all ways in which perfusionists perceive good personal and professional collaboration. Accepting differences in personality and communication styles and accommodating such differences when possible was emphasized.

However, perfusionists perceived that most anesthesiologists felt spending more time with perfusionists would benefit collaboration. Nevertheless, anesthesia was perceived to overwhelm perfusionists. Furthermore, perfusionists perceived that most anesthesiologists encouraged them to speak about suggestions and frustrations regarding workflows, despite a significant number of perfusionists feeling it more challenging to approach anesthesiologists than to approach the perfusion department management. There appears to be mutual intent to communicate and collaborate, yet barriers remain that either side should address to maximize collaboration and directly enhance patient safety.

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