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ORIGINAL ARTICLE

Adherence to Enhanced Recovery after Surgery (ERAS) protocols in cardiac surgery in Pakistan: A cross-sectional survey of current practices.

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ABSTRACT… Objective: To assess the level of adherence to Enhanced Recovery After Surgery (ERAS) protocols among cardiac surgery teams in Pakistan. **Study Design:** Descriptive Cross-sectional Survey. **Setting:** Public and Private Cardiac Surgery Centers Across Pakistan. **Period:** June 2024 to Dec 2024. **Methods:** Using a 20-item questionnaire based on established ERAS guidelines. The survey was distributed electronically to healthcare professionals involved in cardiac surgery, including surgeons, anesthesiologists, critical care physicians, and residents. Responses were analyzed to evaluate compliance across the preoperative, intraoperative, and postoperative phases. **Results:** A total of 65 responses were received. Overall awareness of ERAS protocols was limited, with only 15.4% of participants reporting comprehensive familiarity. High adherence was observed for fasting protocols (92.3%), early extubation (92.3%), chest tube management (96.9%), and goal-directed fluid therapy (84.6%). Moderate adherence was seen in functional status evaluation (70.8%) and postoperative thromboprophylaxis (73.9%). Areas of low adherence included carbohydrate loading (40% never implemented), antifibrinolytic use (47.7% rarely or never used), and delirium assessments (26.2% never performed). Rigid sternal fixation was largely absent (90.8% not utilized). Common barriers included limited resources, lack of institutional protocols, and insufficient training. **Conclusion:** Adherence to ERAS protocols in cardiac surgery within Pakistan is variable, with strong uptake in certain areas and notable deficiencies in others. Improving awareness, standardizing protocols, and addressing infrastructural constraints may enhance the integration of ERAS principles in cardiac surgical care across resource-limited settings.

Key words: ERAS, Cardiac Surgery.

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INTRODUCTION

Enhanced Recovery after Surgery (ERAS) programs have been shown to lessen surgical insult, promote recovery, and improve postoperative clinical outcomes across various specialty operations.[1,2] The goal of ERAS is to return patients to normal functional status as quickly as possible. Initially designed for patients having colorectal surgery, ERAS programs have now been developed for nearly every surgical subspecialty.[3] The ERAS cardiac protocol was published in 2018 and was based on three main tenets: preoperative, intraoperative, and postoperative interventions.

Multiple studies examining the effect of ERAS have demonstrated decreased postoperative complications, length of stay, costs, and increased patient and staff satisfaction. Interest in the application of ERAS to cardiac surgery has grown significantly over the last few years.[4]

Given the growing global burden of non-communicable diseases and the lack of resources in low- and middle-income countries (LMICs) such as Pakistan, the benefits of ERAS are expected to be even greater than those observed in HICs.[5,6] However, adherence to ERAS guidelines in cardiac surgery, particularly in developing countries, remains suboptimal due to a multitude of challenges. These challenges include limitations in healthcare infrastructure, variability in surgical expertise, and disparities in the availability of perioperative care resources.[7,8] Although the adoption of ERAS guidelines is critical to achieving optimal outcomes, data on adherence to these guidelines in Pakistan remain scarce.[9]

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To bridge this gap, the present study aims to evaluate the adherence to ERAS guidelines among cardiac surgery teams in Pakistan, using a questionnaire survey to assess preoperative, perioperative, and postoperative management practices.

A total of 20 questions, designed to assess various facets of the ERAS protocol, were distributed to a range of healthcare professionals involved in cardiac surgery, including cardiac surgery residents, consultants, critical care physicians, and anesthesiologists. The survey aimed to assess the degree to which ERAS principles are integrated into clinical practice. Given the crucial role of ERAS in improving surgical outcomes, this research is vital for understanding the existing gaps in its implementation in Pakistan and for providing actionable insights to improve patient care.

METHODS

This study employed a cross-sectional survey design to assess the adherence to Enhanced Recovery after Surgery (ERAS) guidelines in cardiac surgery at various hospitals in Pakistan. The survey focused on evaluating practices in preoperative, perioperative, and postoperative care among healthcare professionals involved in cardiac surgery. A 20-item questionnaire was designed, addressing key aspects of the ERAS protocol as applied in cardiac surgery, including preoperative patient education, optimization of nutritional and medical factors, perioperative management, and postoperative recovery strategies.

Study Design

A descriptive, cross-sectional survey design was used to collect data from healthcare professionals in cardiac surgery. A 20-item questionnaire was distributed through Google Forms to cardiac surgeons, residents, anesthesiologists, critical care physicians, and nursing staff involved in the management of cardiac surgery patients. The survey aimed to assess the extent to which ERAS guidelines were being followed, identifying both strengths and areas for improvement in clinical practice.

Participants

The study targeted healthcare professionals who are directly involved in the perioperative care of cardiac surgery patients, including:

- Cardiac Surgery Residents and Consultants: Surgeons directly involved in the surgical procedures and preoperative decision-making.
- Anesthesia Residents and Consultants: Specialists involved in anesthesia management during surgery.
- Critical Care Physicians: Doctors managing postoperative recovery in the cardiac intensive care unit (ICU).

Healthcare professionals from both public and private hospitals in Pakistan were invited to participate. A purposive sampling method was used, with the inclusion criterion being active involvement in cardiac surgery care.

Questionnaire Development

The questionnaire was developed to cover all major aspects of the ERAS protocol, with specific attention to preoperative, perioperative, and postoperative management practices. The 20 questions were derived from core ERAS principles, addressing the following areas:

Preoperative Care

- Patient Education and Counseling: Participants were asked if patients received adequate preoperative information, education, and counseling regarding the procedure.
- Albumin and HbA1c Measurement: Questions addressed whether preoperative albumin levels and HbA1c were measured and optimized where necessary.
- Nutritional Support: Respondents were asked whether nutritional support was provided to patients preoperatively if needed.
- Fasting Protocol: The length of time patients were kept nil by mouth (NPO) for fluids and solids before surgery was inquired.
- Carbohydrate Loading: Participants were asked if patients received carbohydrate loading two hours before surgery.
- Smoking and Alcohol Cessation: The survey assessed whether patients were required to cease smoking and alcohol intake at least one month before surgery.
- Functional Status Evaluation: Respondents

were asked if a preoperative functional status evaluation was conducted for all patients.
- Topical Nasal Decolonization: Questions addressed whether intranasal decolonization was implemented as part of preoperative care.
- Antibiotic Prophylaxis: Participants were asked if antibiotic prophylaxis was given 60 minutes before skin incision.

Perioperative Care
- Multimodal Analgesia: The use of non-opioid analgesia (e.g., gabapentin, acetaminophen, regional blocks) for perioperative pain management was assessed.
- Sternal Fixation: Participants were asked if rigid sternal fixation with plates was routinely used to avoid complications after sternotomy.
- Goal-Directed Fluid Therapy: The use of goal-directed fluid therapy during surgery was queried.
- Antifibrinolytic Agents: The survey assessed whether antifibrinolytic agents (e.g., tranexamic acid, aminocaproic acid) were used perioperatively

Postoperative Care
- Early Extubation Protocol: Respondents were asked if their center followed an early extubation protocol, with extubation typically occurring within six hours post-surgery.
- Delirium Assessment: Participants were asked if delirium assessments were regularly performed during ICU stays using a standardized confusion assessment method (CAM) at least once per nursing shift.
- Chest Tube Management: The survey inquired if chest tubes were maintained with adequate patency and proper sterilization in the early postoperative period.
- Thromboprophylaxis: Questions addressed the use of chemical or mechanical thromboprophylaxis in the postoperative period to prevent venous thromboembolism.
- Early Mobilization: The survey assessed whether early mobilization practices were followed, with patients being encouraged to move or ambulate on postoperative day (POD) 1.

Data Collection

The survey was administered electronically via Google Forms between [Insert start date] and [Insert end date]. The link to the form was shared with eligible participants through email and professional WhatsApp groups. Participation was voluntary, and all respondents were assured of confidentiality. Reminders were sent to encourage participation and improve response rates. A total of 65 responses were collected from various healthcare providers in cardiac surgery units across multiple hospitals in Pakistan.

Data Analysis

The collected data were exported from Google Forms to Microsoft Excel for cleaning and analysis. Descriptive statistics were used to summarize the data. Frequencies and percentages were calculated for categorical variables, such as whether or not ERAS practices were followed. Adherence to each ERAS guideline was categorized as:

High Adherence: Full compliance with ERAS guidelines.
Low Adherence: Little to no adherence to ERAS principles.

Responses to open-ended questions were analyzed using thematic analysis to identify common barriers or challenges to ERAS implementation. Themes were categorized based on emerging patterns, such as resource limitations, staff training deficits, or logistical challenges in adopting certain ERAS practices.

RESULTS

Demographic and Workplace Information

A total of 65 respondents participated in the survey, comprising various roles in the cardiac surgery and anesthesia teams. The majority of respondents were cardiac surgery consultants (52.3%), followed by cardiac surgery residents (32.3%), cardiac anesthesia residents (9.2%), and fewer cardiac critical care workers (1%) and anesthesia/critical care consultants (3%) as shown in Figure-1.

A significant portion of participants (72.3%) reported working in both government and private hospitals as shown in Figure-2.

Knowledge of ERAS Protocols

The knowledge of Enhanced Recovery after Surgery (ERAS) protocols varied among respondents. Approximately 15.4% of respondents (37 participants) reported being familiar with the ERAS protocols, while 27.7% (18 participants) had heard about it but lacked in-depth knowledge. A large proportion (56.9%, 10 participants) indicated they were not familiar with the ERAS protocols at all. This lack of awareness highlights a need for increased education and training on ERAS guidelines within the cardiac surgical community in this setting.

Fasting Protocol

The preoperative fasting durations for both solids and fluids were evaluated across defined time intervals. The majority of patients reported being NPO for 6–12 hours for solids (66.2%) and 4-6 hours for fluids (40%), indicating a prevalent trend compliant with recommended guidelines. A smaller proportion of 26.2% fasted for 4–6 hours for solid food, while only a limited number adhered to shorter fasting durations of 2–4 hours or exactly 2 hours. Notably, 6.2% of patients also reported fasting for more than 12 hours, particularly for solids. All of this is delineated in Figures-4 and 5.

ERAS Protocol Adherence

To assess adherence to ERAS protocols, the responses were categorized into three groups: High Adherence and Low Adherence, based on the percentage of compliance with specific preoperative factors as outlined in the ERAS guidelines.

Pre-operative Period

High adherence group (71-92.3%)

During the preoperative period, in the high adherence group, our study found that about 92.3% of respondents adhered to ERAS fasting recommendations for both fluids and solids. About 92.3% of respondents successfully followed early extubation protocols within 6 hours of surgery. We found that functional status was assessed preoperatively by 70.8% of respondents. About 57.7% of respondents consistently provided preoperative information, education, and counselling to the patients. 47.7% of respondents always measured and optimized HbA1c levels, reflecting good practice in diabetes management.

Low adherence group (32.3-47.7%)

It was reported that nearly one-third (32.3%) of the respondents rarely or never optimized albumin preoperatively. This highlights a critical area for improvement in preoperative nutritional optimization. Moreover, a significant proportion of respondents (40%) reported not using preoperative carbohydrate loading. This deviates from current ERAS (Enhanced Recovery After Surgery) guidelines. The lack of adherence suggests a potential gap between evidence-based guidelines and clinical practice, highlighting the need for improved implementation strategies.

The findings of the preoperative period are shown in Figure-5.

Peri-operative Period

High adherence group (71-92.3%)

During the perioperative period it was found out that 84.6% of respondents mostly or always employed goal directed fluid therapy. This practice is known to reduce postoperative complications and provide faster recovery aligning well with ERAS principles. In terms of antibiotic prophylaxis, 63.1% of respondents always administered antibiotics within 60 minutes prior to skin incision. This timely administration of antibiotic is a key factor in controlling the surgical site infections, and is a core recommendation of ERAS protocols.

Low adherence group (32.3-47.7%)

A vast majority (90.8%) of respondents no longer used rigid sternal fixation with plates, reflecting poor adherence to this protocol. Nearly half of respondents (47.7%) reported rarely or never using antifibrinolytic agents such as aminocaproic acid or tranexamic acid during the perioperative period. This underutilization suggests a disparity between evidence-based practices and current perioperative management strategies.

The findings of perioperative period are shown in Figure-6.

Postoperative Period

High adherence group (71-92.3%)

During the postoperative period, 96.9% of respondents mostly or always ensured chest tube patency without compromising sterility. This is an

important measure to reduce infection risk and provide effective drainage. Early mobilization on postoperative day 1 was practiced by 74.8% of respondents, which is, in fact, a key element of the ERAS pathway associated with improved pulmonary function and reduced length of stay. Additionally, 73.9% of respondents always or mostly used thromboprophylaxis in the postoperative period, supporting venous thromboembolism prevention, a major concern in thoracic surgical patients.

Low adherence group (32.3-47.7%)

Over one quarter of respondents (26.2%) reported never assessing delirium status postoperatively. Given the high incidence and serious consequences of postoperative delirium, this reveals a significant gap in cognitive monitoring and care during recovery. Additionally, a small but concerning proportion of respondents (7.7%) indicated that they rarely or never provided thromboprophylaxis in the postoperative period. Considering the strong association between thromboprophylaxis and prevention of venous thromboembolism, even this low rate highlights the need for greater consistency in adhering to best practices.

These postoperative findings are described in Figure-7.

The overall implementation of ERAS protocols in this developing country setting reveals a mixed adherence across the preoperative, perioperative, and postoperative periods.

- High adherence was noted in key areas such as preoperative fasting, early extubation, chest tube care, and early mobilization. These practices align well with ERAS principles, which aim to improve recovery and reduce complications.
- Low adherence was noted in protocols such as carbohydrate loading, antifibrinolytic use, and rigid sternal fixation, which require further attention and reinforcement.

  These findings highlight the need for ongoing education, training, and standardized protocol implementation to ensure more consistent adherence to ERAS guidelines. Fostering a culture of ERAS care in this setting could significantly improve patient outcomes, reduce complications, and optimize recovery after cardiac surgery.

FIGURE-1

Demographics of participants:

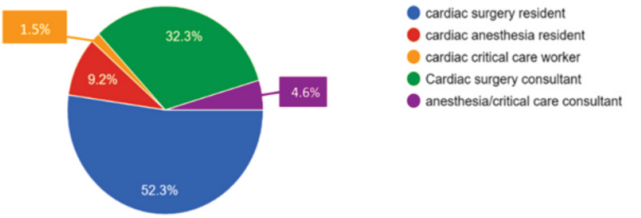


FIGURE-2

Type of healthcare facility:

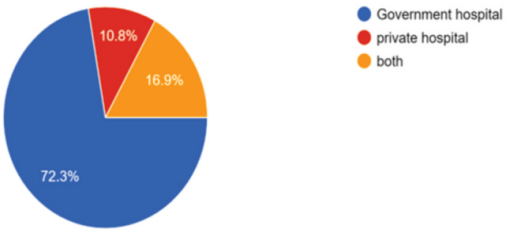


FIGURE-3

Knowledge of ERAS Protocols:

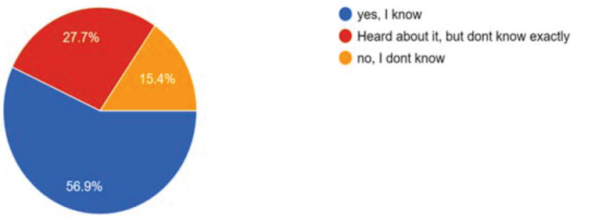


FIGURE-4

Fasting Protocol: a) Nil by mouth for fluids b) Nil by mouth for solids

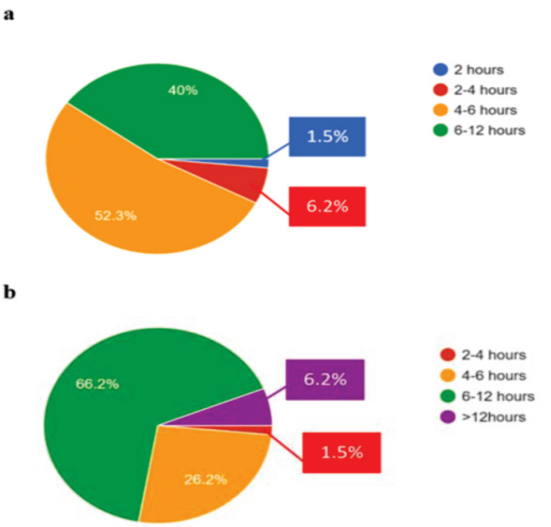


FIGURE-5

ERAS Adherence during the Pre-operative period

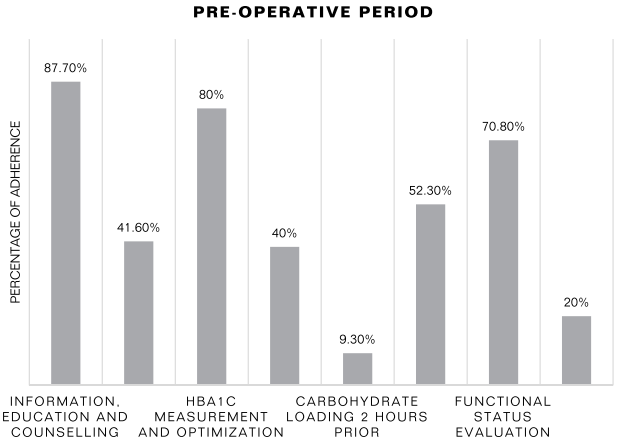


FIGURE-6

ERAS Adherence during the Peri-operative period

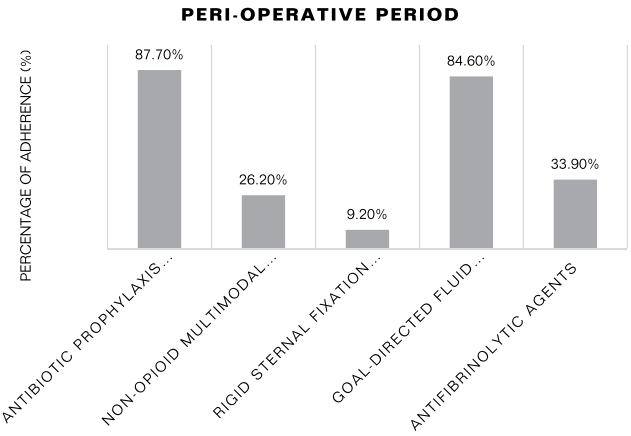
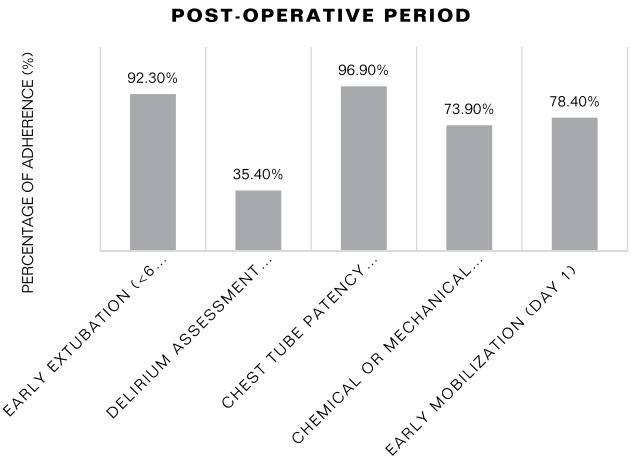


FIGURE-7

ERAS Adherence during the Post-operative period



DISCUSSION

The implementation of Enhanced Recovery after Surgery (ERAS) protocols in developing countries, particularly in the context of cardiac surgery, faces several challenges despite the well-documented benefits of improved patient outcomes, reduced hospital costs, and increased patient satisfaction.[10] Furthermore, implementing ERAS could contribute to standardizing care, improving communication and teamwork among healthcare providers, and ensuring that patients receive a comprehensive, evidence-based approach to recovery.[11] These benefits, however, have not always translated into widespread adoption, especially in settings with limited resources and infrastructure. The slow or non-existent adoption of ERAS programs, as observed in our own institutions, can largely be attributed to several key barriers.[12]

One of the biggest barriers to implementing ERAS protocols is the lack of resources in developing countries, including financial constraints, staffing shortages, and limited space, all of which hinder the creation of the necessary infrastructure for ERAS.[13] These limitations affect the ability to maintain a dedicated, multidisciplinary ERAS team. Additionally, a lack of trained personnel poses a major challenge.[14] (3)(3) Our results show that only 15.4% of doctors were fully familiar with ERAS, while 27.7% had only partial knowledge, and 56.9% had no knowledge at all, highlighting a significant gap in training. This lack of education and awareness among healthcare providers makes it difficult to effectively integrate ERAS into practice.

Resistance to change within the perioperative team is another obstacle. Many healthcare providers are accustomed to traditional methods and remain skeptical about adopting ERAS, especially when the benefits are not immediately apparent or require significant changes in practice. This resistance is compounded by inconsistencies in the adoption of ERAS protocols.[15] Within some institutions, certain surgeons may adopt practices such as early Extubation (67.7%), early mobilization (41.5%), and preoperative evaluations, while others may not fully integrate these practices. This lack of uniformity further complicates the establishment of standardized care pathways and hampers the

overall implementation of ERAS and establishment of standardized care pathways. At the institutional level, the absence of formal ERAS guidelines is another challenge. Without clear, widely accepted guidelines, healthcare providers may not fully understand how to implement ERAS protocols, leading to fragmented or inconsistent care.[16]

However, certain perioperative practices have shown relatively high adherence. Antibiotic prophylaxis administered within 60 minutes before skin incision was followed by 63.1% of respondents, likely due to its well-established role in reducing postoperative infections.[17] Similarly, 67.7% of respondents practiced early extubation, which is supported by evidence demonstrating benefits such as reducing ventilator-associated pneumonia and shortening ICU stays.[18] Early mobilization (41.5%) and chest tube patency maintenance (56.9%) also showed relatively high adherence, as both practices are essential for preventing complications and promoting faster recovery.[19] These protocols are likely more easily adopted due to their strong evidence-based, clear clinical guidelines and visible benefits, making them more straightforward and attractive to healthcare teams for consistent implementation.

On the other hand, the least adhered-to practices in the perioperative periods were non-opioid multimodal analgesia, use of antifibrinolytic agents, and delirium assessments. Only 16.9% of respondents always used non-opioid analgesia, and 23.1% rarely incorporated it, suggesting reluctance to adopt this approach despite its proven benefits in reducing opioid use and enhancing recovery.[20] This may be due to unfamiliarity with alternative analgesics or concerns about their effectiveness in managing postoperative pain, particularly in high-risk cardiac surgery patients. The use of antifibrinolytic agents was also inconsistent, with 35.4% never using them, and delirium assessment with 26.2% of respondents never conducting it. This may be due to unfamiliarity with their indications, varying institutional guidelines, lack of standardized screening tools, limited awareness, and resource constraints.[21,22]

In conclusion, while the ERAS protocol offers significant benefits for patient recovery, its implementation in developing countries faces several challenges. Overcoming these barriers requires addressing resource limitations, increasing education and training for healthcare providers, fostering a culture of change, and developing institutional guidelines that support standardized care. By addressing these factors, ERAS protocols can be more effectively integrated into cardiac surgery, ultimately improving patient outcomes in resource-limited settings.

CONCLUSION

Implementation of ERAS in cardiac surgery in Pakistan remains inconsistent, with satisfactory compliance in certain practices but limited adoption of several essential guideline components. Key barriers include insufficient awareness, lack of standardized protocols, and resource limitations, underscoring the need for focused education, structured ERAS pathways, and strengthened multidisciplinary collaboration to enhance perioperative care.

Ethical Considerations

Data was anonymized to maintain confidentiality. Informed consent was obtained before administering the questionnaire. The study was approved from ethical review committee (54-2023/DME/FIC/FSD-20-01-23).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Shahbaz Ahmad Khilji:** Acquisition, data analysis, drafting.
2	**Muhammad Azam:** Concept and design.
3	**Alifa Sabir:** Critical revisions.
4	**Wajiha Arshad:** Interpretation of data.