

The Current Scenario of Extracorporeal Cardiopulmonary Resuscitation in India and Its Future

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ABSTRACT

Extracorporeal cardiopulmonary resuscitation (ECPR) signifies a crucial progression in treating refractory cardiac arrest, offering circulatory and respiratory support via extracorporeal membrane oxygenation (ECMO) during cardiopulmonary resuscitation (CPR). Extracorporeal cardiopulmonary resuscitation has shown the potential to improve outcomes, especially in select patient populations, by stabilizing hemodynamics and allowing time to treat underlying reversible arrest causes. Despite promising evidence, ECPR remains a complex, resource-intensive intervention with significant challenges, including the need for specialized training. While the availability and utilization of ECMO have increased in India, awareness and understanding of ECPR remain limited, particularly outside major tertiary centers. The knowledge gap can influence the timely initiation and success of ECPR, as studies indicate that physician understanding of indications, contraindications, and procedural steps is essential for patient outcomes. Extracorporeal cardiopulmonary resuscitation requires highly specialized equipment and personnel, and is expensive. The exact incidence and knowledge gap regarding ECPR among Indian practitioners remain unclear. Understanding the incidence and obstacles in initiating ECPR, along with the level of knowledge among doctors in India, is crucial for advancing health care. This survey evaluates the current knowledge of ECPR among doctors in India and pinpoints the areas that need improvement.

Keywords: Cardiogenic shock, Extracorporeal cardiopulmonary resuscitation, Extracorporeal membrane oxygenation, Venoarterial ECMO.

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INTRODUCTION

Extracorporeal cardiopulmonary resuscitation (ECPR) signifies a significant advancement in treating refractory cardiac arrest. It offers both circulatory and respiratory support via extracorporeal membrane oxygenation (ECMO) during cardiopulmonary resuscitation (CPR).¹ Extracorporeal cardiopulmonary resuscitation has demonstrated potential in enhancing patient outcomes, particularly for specific subgroups, by stabilizing hemodynamics and providing time to address the underlying reversible causes.² Despite the promising evidence it shows, ECPR still remains a complex, resource-intensive intervention with significant challenges, including the need for specialized training, quick decision-making, and multidisciplinary collaboration.³

In recent years, the availability and utilization of ECMO have significantly increased in India, but the awareness and understanding of ECPR remain limited, particularly outside major tertiary centers.⁴ The knowledge gap can greatly influence the timely initiation and success of ECPR, as studies have indicated that physician's understanding of indications, contraindications, and procedural steps is essential for patient outcomes.⁵ Assessing Indian health care providers' knowledge of ECPR and perceived barriers is essential for guiding education, training, and protocol development.⁶ Extracorporeal cardiopulmonary resuscitation requires highly specialized equipment and personnel, and it is expensive. A Finnish study calculated the median cost per quality-adjusted life year (QALY) of 7,474–12,642€ for venoarterial ECMO in a mixed cardiogenic shock and cardiac arrest population.⁷

The exact incidence and knowledge gap regarding ECPR among Indian practitioners remain unclear. Understanding the incidence and obstacles to initiating ECPR, along with the level of knowledge among doctors in India, is crucial for further advancing health care. This survey assesses doctors' knowledge of ECPR in India, highlights

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areas for improvement, and identifies challenges in implementing ECPR in health care facilities.

METHODOLOGY

This study is a cross-sectional, descriptive survey conducted to assess the incidence, knowledge, and understanding of ECPR among doctors across India. Our survey aimed to gather quantitative data on current knowledge levels, attitudes, and perceived barriers related to ECPR among doctors across India. In our survey, we targeted licensed physicians working in the critical care specialty. Invitations were extended to doctors practicing at primary, secondary, and tertiary health care facilities nationwide.

We included practicing physicians in India with experience in critical care. Participation in our survey was purely voluntary. Data were collected through a structured, self-administered online

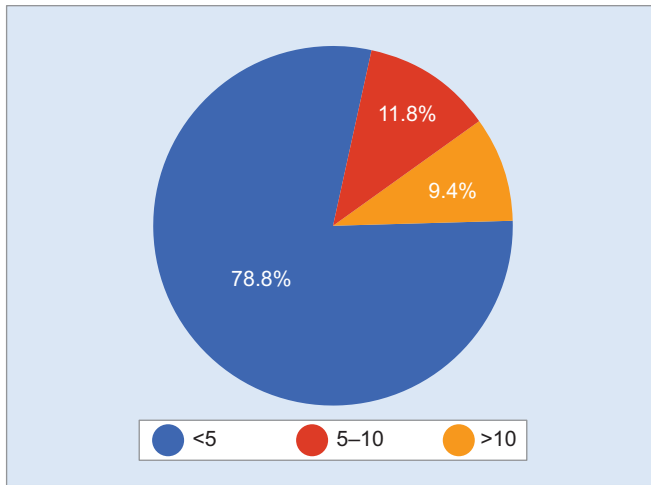


Fig. 1: How many ECPRs have you done so far?

questionnaire developed in Google Forms, ensuring ease of access and broad outreach. The questionnaire consisted of 34 questions across two sections. It was designed based on a literature review and reviewed by experts in ECPR and critical care. We included both in-hospital and out-of-hospital cardiac arrests. Survey questions included both multiple-choice questions and open-ended questions to comprehensively assess knowledge, attitudes, and perceived barriers to ECPR in India.

The Google Forms questionnaire comprised demographic details of the participants, including age, gender, years of experience, specialty, and type of health care facility. It also included questions that focused on indications, contraindications, perceived benefits, limitations, and personal confidence in performing ECPR.

RESULTS AND DISCUSSION

A total of 103 physicians participated in our survey, with 85 completing all questions and were included in the final analysis. Responses were gathered from a broad spectrum of hospitals throughout India, including significant representation from major cities such as Mumbai, Hyderabad, Kolkata, Jaipur, Bengaluru, and Chennai. Participants included those from both primary and secondary cities. Extracorporeal cardiopulmonary resuscitation practices were implemented across various medical environments, predominantly within tertiary institutions.

On analyzing the number of ECPR, respondents represented diverse hospitals across India, with most having performed fewer than five ECPR cases, which indicates a limited experience among Indian practitioners. About 78.8% of the respondents performed <5 cases, 11.8% between 5 and 10 cases, and only 9.4% had performed more than 10 cases. Extracorporeal cardiopulmonary resuscitation is at an early stage in most medical centers, with a limited amount of practical experience among physicians (Fig. 1).

About 23.5% of the participants used ECPR in both the adult and pediatric populations. A majority of 68.2% of participants were exposed only to the adult population.

Additionally, 14.5% of respondents believed that more than 10 patients annually benefit from ECPR at their hospital, suggesting a relatively small proportion.

An overwhelming 84.7% emphasized the need for specialized ECPR team training, with regular simulations every 3–6 months

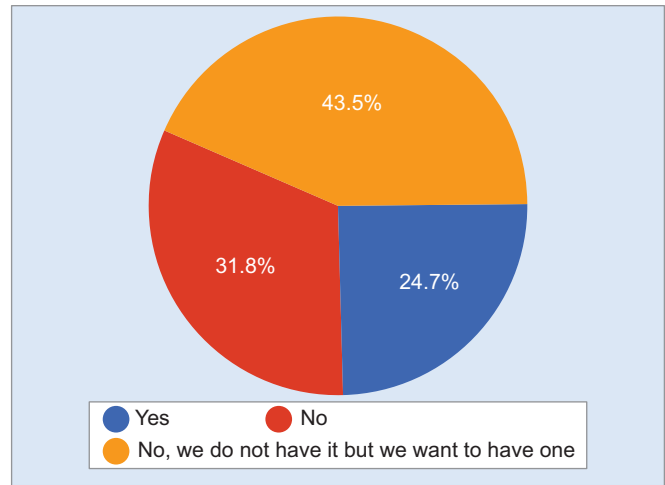


Fig. 2: Do you have a protocol to analyze and assess your ECPR program?

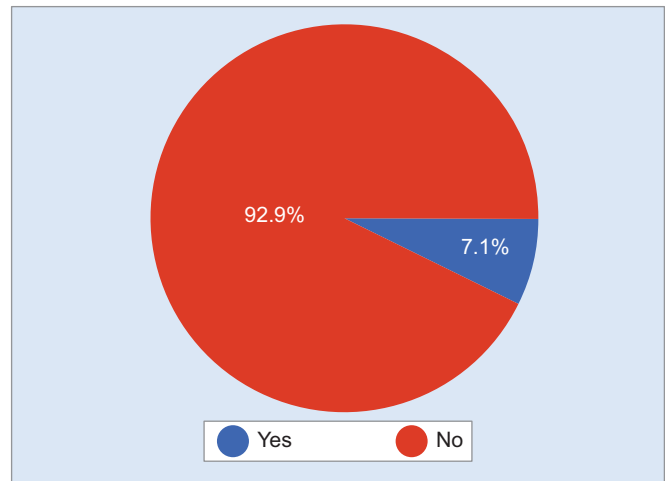


Fig. 3: Have you done out-of-hospital ECPR?

preferred by most participants. However, about 55.4% have protocols at their institution to analyze ECPR programs and maintain registries. About 43.5% lacked registries, which indicates that there is still a gap in documentation and standardization of ECPR protocol in most places. Only 24.7% reviewed their registry, and about 31.8% of participants felt that there is no review of the registry. This again indicates a clear lack of protocol for ECPR in the majority of hospitals in India (Figs 2 to 4).

Out-of-hospital ECPR (OHCA) is rare, with only 7.1% having attempted it, though 25.9% expressed interest in establishing such programs.

Financial consent, lack of trained personnel, and absence of protocols were identified as major hurdles in conducting ECPR.

Encouragingly, ECPR survival rates of 50–75% were reported by 66.7%, with favorable neurological outcomes in 64.9% of survivors (Figs 5 to 8).

Femoral access was the predominant cannulation site, utilized in 70% of cases. Manual CPR remained the primary method for resuscitation, being used in 89.4% of instances, with only limited implementation of automated CPR machines, which were employed in monitoring CPR quality in 8.2% of cases. A significant portion, 73.5%, of participants reported the absence of a dedicated ECPR

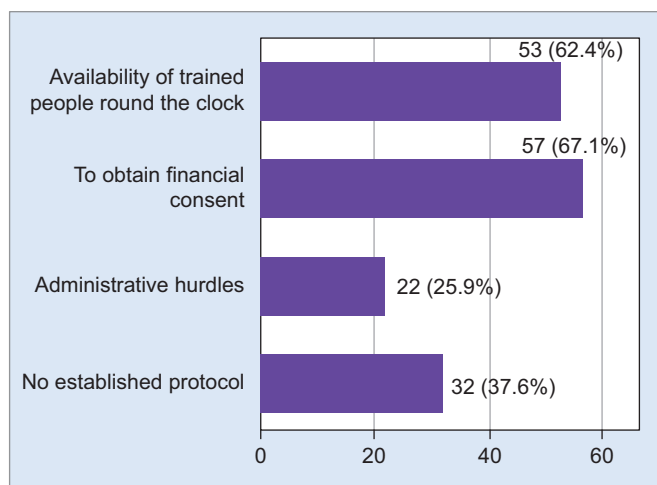


Fig. 4: Major hurdles faced in conducting ECPR?

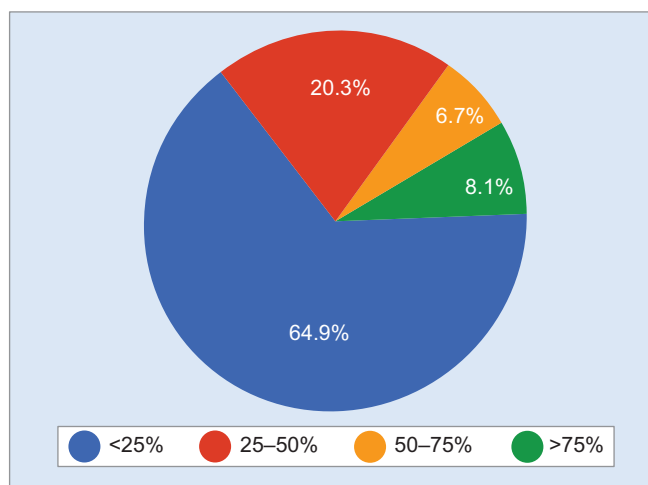


Fig. 7: How is the neurological outcome in patients in ECPR?

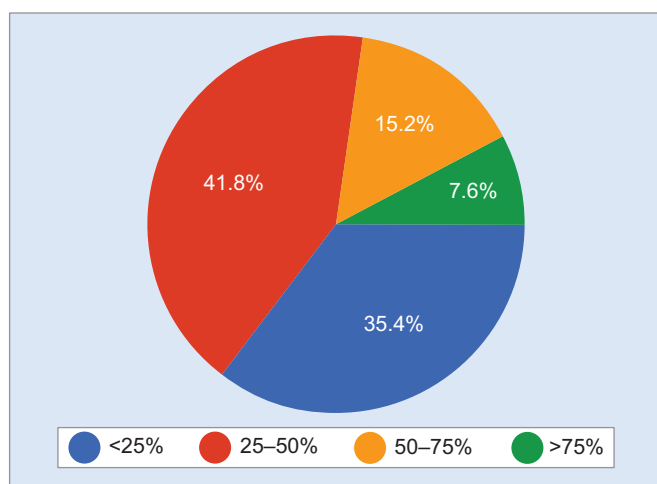


Fig. 5: How is the survival percentage of conventional CPR at your institute?

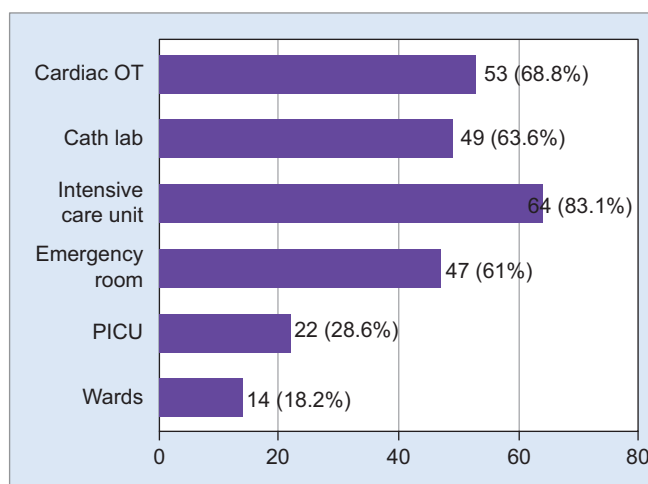


Fig. 8: Places where ECPR is initiated at your hospital?

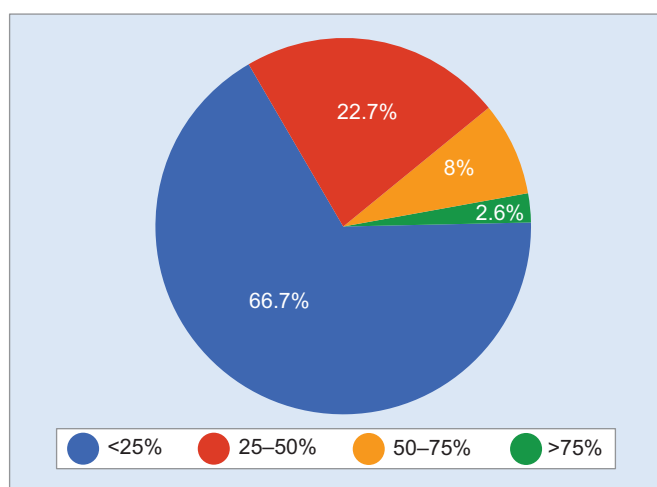


Fig. 6: How is the survival of ECPR at your institute?

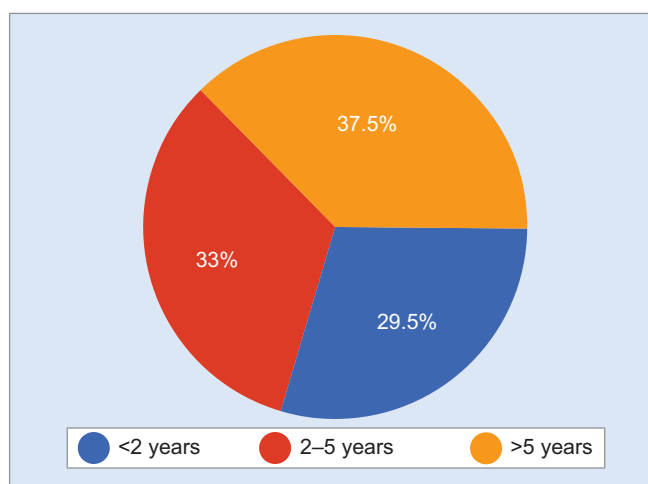


Fig. 9: Years of experience in ECPR

team at their hospitals, and 42.3% indicated that their hospitals do not have a code ECPR system (Figs 9 to 11).

Our survey indicated that ECPR was implemented in most areas of the hospital, other than the critical care unit. Opinions on managing prolonged low-flow states and the early initiation

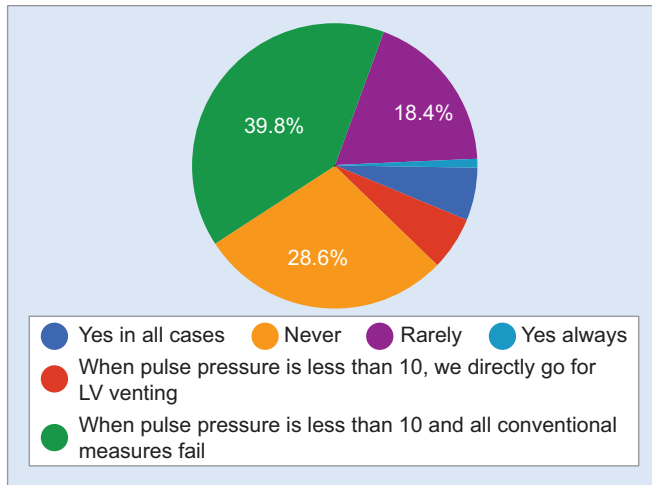


Fig. 10: How often do you use LV vent in patients?

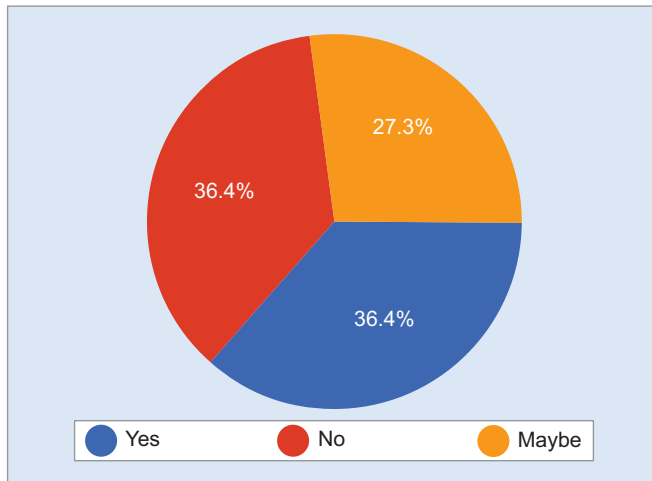


Fig. 11: Do you consider ECPR for more than 60 minutes of low-flow state if potentially reversible?

of ECPR were diverse, emphasizing the need for more definitive guidelines. These findings highlight the necessity for enhanced training, standardization of protocols, consistent registry maintenance, and increased investment in technology to advance ECPR practices and outcomes in India.

WHAT IS THE FUTURE IN INDIA?

Our survey identifies essential areas for improvement in the implementation and execution of ECPR practices in India. Addressing these areas can significantly enhance outcomes. Training and education in ECPR should be given top priority, with most respondents emphasizing the need for specialized and regular simulation-based training programs to maintain skills and ensure preparedness. Institutions should develop standardized protocols for ECPR implementation, assessment, and evaluation to address current inconsistencies and administrative barriers. Additionally, maintaining comprehensive ECPR registries can facilitate better tracking of outcomes, support data-driven decision-making, and encourage research to refine best practices. Financial and logistical

challenges also require attention; there is a need to streamline the consent process and secure funding or subsidies to make ECPR more accessible. Incorporating advanced technologies, such as automated CPR machines, pre-primed circuits, and routine use of ultrasound guidance for cannulation, can improve procedural efficiency and success rates. The survey also highlights the potential of expanding ECPR into out-of-hospital settings, with logistical planning and training necessary to establish effective OHCA programs. Collaboration with professional organizations, such as ESOI, can provide additional support, resources, and frameworks for institutions. Addressing these recommendations comprehensively can help overcome barriers and build robust ECPR systems, ultimately saving more lives and improving the quality of care in India.

ARTIFICIAL INTELLIGENCE (AI) DISCLOSURE

The authors declare that no AI tools were used in the preparation, writing, analysis, or editing of this manuscript.

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AUTHORS' CONTRIBUTIONS (CREDIT FORMAT)

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