News Release

The impact of hospital-level median door-to-extracorporeal cardiopulmonary resuscitation time on the prognosis of patients with refractory out-of-hospital cardiac arrest

Key Points

- Transporting patients with refractory cardiac arrest to hospitals with shorter hospital-level Door-to-ECPR times is associated with higher survival rates and better neurological outcomes.
- Door-to-ECPR time metrics has potential as a novel quality indicator reflecting the quality of the ECPR process.

Summary

Assistant Professor Daisuke Kasugai from the Department of Emergency and Critical Care Medicine, Nagoya University Hospital, along with Assistant Professor Yohei Okada from Health Services and Systems Research, Duke-NUS Medical School, National University of Singapore, medical student Yuka Mizutani from Nagoya University School of Medicine, Assistant Professors Shingo Kazama and Toru Kondo from the Department of Cardiology, Nagoya University Hospital, and Professor Naonori Yamamoto from the Department of Emergency and Critical Care Medicine, Nagoya University Hospital, analyzed data from the Japanese Association for Acute Medicine Out-of-Hospital Cardiac Arrest Registry (JAAM-OHCA). They found that hospitals with shorter median Door-to-ECPR times (time from patient arrival to initiation of extracorporeal cardiopulmonary resuscitation) had significantly higher survival rates and better neurological outcomes.

Sudden cardiac arrest is a critical condition in which the heart and lungs abruptly stop functioning. In cases where conventional cardiopulmonary resuscitation (CPR) is ineffective—referred to as refractory cardiac arrest—mortality rates are very high. Extracorporeal cardiopulmonary resuscitation (ECPR) is emerging as a key intervention for these patients. ECPR temporarily takes over circulation and oxygenation using extracorporeal membrane oxygenation (ECMO) until the heart resumes functioning. The process of initiating ECPR involves complex procedures and team coordination. The international organization ELSO recommends establishing sufficient ECMO blood flow within 60 minutes of cardiac arrest, though the supporting data remain limited.

The research team analyzed data from 2,136 patients and confirmed that hospitals with shorter median Door-to-ECPR times achieved higher survival and recovery rates. Specifically, hospitals with a median Door-to-ECPR time of 27 minutes or less had approximately 1.4–1.5 times higher survival rates at 30 and 90 days after treatment, respectively, compared to hospitals with longer initiation times. Improvements in neurological outcomes were similarly significant.
This study highlights the potential importance of establishing Door-to-ECPR time as a quality indicator at the hospital level, facilitating nationwide sharing and benchmarking to improve overall quality of care. Collecting detailed in-hospital data, developing standardized procedures, and enhancing information sharing with emergency medical services could further improve response times. These findings were published in the journal *Critical Care Medicine* on June 16, 2025.

Research Background

Sudden cardiac arrest is a life-threatening emergency characterized by an abrupt cessation of heart and lung function. In cases of refractory cardiac arrest—where conventional cardiopulmonary resuscitation (CPR) alone is insufficient—mortality rates remain extremely high. Recently, extracorporeal cardiopulmonary resuscitation (ECPR)(*1) has gained attention as a promising treatment. ECPR utilizes extracorporeal membrane oxygenation (ECMO) to temporarily maintain blood circulation and oxygenation, supporting the patient until the heart resumes function.

Initiating ECPR involves complex procedures and coordinated teamwork. The international organization ELSO recommended in its 2021 guidelines that sufficient ECMO blood flow should be established within 60 minutes after cardiac arrest. However, there is limited evidence supporting this recommendation. A critical factor attracting attention is Door-to-ECPR time(*2)—the interval from a patient's hospital arrival to the initiation of ECMO support. It has been reported that each 3-minute delay at the individual patient level can significantly worsen neurological outcomes, underscoring the importance of shortening this interval. Facility-level Door-to-ECPR time might reflect the quality of the hospital's ECPR readiness, but most previous research was limited to single-center studies, leaving its broader significance unclear.

Research Results

In this study, we analyzed data from 2,136 patients with refractory out-of-

hospital cardiac arrest (OHCA) who underwent ECPR, registered in the JAAM-OHCA database. We found that hospitals with shorter Door-to-ECPR times had significantly higher survival rates and better neurological outcomes. Specifically, hospitals with a median Door-to-ECPR time of 27 minutes or less (rapid-implementation group) showed survival rates approximately 1.4 times higher at 30 days and 1.5 times higher at 90 days compared to hospitals with longer times (delayed-implementation group). The proportion of patients achieving favorable neurological recovery showed similar improvement. Additionally, we observed a trend indicating that higher case volume was associated with shorter Door-to-ECPR times, suggesting experience and effective teamwork as key factors. Furthermore, the national average Door-to-ECPR time decreased by approximately one minute per year from 2014 to 2021, demonstrating gradual nationwide improvement.

Research Summary and Future Perspective

This study demonstrated that shorter hospital-level Door-to-ECPR times are associated with improved survival rates and better neurological outcomes. These findings suggest that establishing and utilizing Door-to-ECPR time as a hospital-level quality indicator, with nationwide sharing and visualization, could be highly beneficial. Public disclosure of these indicators and providing feedback can encourage benchmarking among hospitals, naturally leading to continuous quality improvement. Identifying specific factors that contribute to shortening Door-to-ECPR times—such as ECMO team composition, simulation training frequency, and optimal placement of cannulation equipment—requires detailed data collection and analysis within hospitals. Sharing these insights across multiple institutions may facilitate the development of standardized protocols that can be adopted even by hospitals with fewer cases. Additionally, strengthening real-time communication and coordination with emergency medical services to enable proactive preparation by ECMO teams before patient arrival has the potential to further reduce Door-to-ECPR times.

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