

# 学 位 論 文 の 要 旨

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学 位 論 文 名 Factors Associated with Return of Spontaneous Circulation in Out-of-Hospital Cardiopulmonary Arrest Cases

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## 論 文 内 容 の 要 旨

### INTRODUCTION

More than 100,000 out-of-hospital cardiopulmonary arrests (OHCA) occur annually in Japan, and the number is expected to continue to increase as the population ages. In order to improve the social rehabilitation of OHCA patients, it is of utmost importance to achieve the return of spontaneous circulation (ROSC) at an early stage. It has been reported that the longer the time from cardiac arrest until ROSC, the worse the chance of successful social rehabilitation and that the ability to reintegrate into society substantially decreases. The importance of ROSC for social rehabilitation of OHCA patients is gaining in recognition around the world.

However, there have been few reports on early ROSC, which is most important for the social rehabilitation of OHCA patients. In particular, there has been no detailed analysis of the effects of treatments performed by the Emergency medical technician (EMT) and bystanders who happen to be at the site and time factors. In the present study, OHCA cases were investigated based on Utstein style items to clarify factors contributing to ROSC in Japan and the measures to improve ROSC rates were examined.

### MATERIALS AND METHODS

This is a cross-sectional study. The Fire and Disaster Management Agency (FDMA) database which included 30,704 out of 123,095 OHCA cases (because of internal and external factors) that were transported to medical institutions by EMT between January 01, 2010, and December 31, 2010, was analyzed. Data are presented as means (standard deviations) or *n* (%), unless specified otherwise. Statistical analysis was performed with successful ROSC as the

dependent variable and Utstein style items as the independent variable. First, considering multicollinearity, independent variables with a variance inflation factor of less than 10 were selected, and logistic regression analysis was performed. Then, to clarify factors contributing to ROSC, a univariate logistic analysis was performed, and the degree of contribution of the category data and continuous variables was determined by the odds ratio (95% confidence interval). Then, a multivariate analysis was performed. IBM SPSS Statistics version 24.0 was used for statistical analysis. The study protocol was approved by the Research Ethics Committee of Shimane University (approval number is 1341).

## **RESULTS AND DISCUSSION**

Odds ratios obtained from multivariate analysis were as follows: age, 0.99 (0.99–0.99); sex, 1.22 (1.13–1.31); an EMT-staffed ambulance, 1.56 (1.17–2.09); a physician-staffed ambulance, 3.06 (2.68–3.49); bystander-performed CPR, 1.25 (1.16–1.34); PAD, 1.55 (1.22–1.96); PEA, 2.45 (2.24–2.68); VF and VT, 7.87 (7.09–8.72); airway maintenance using a device, 0.78 (0.73–0.85); administration of epinephrine, 3.09 (2.84–3.35); and etiology of cardiac arrest, 0.61 (0.56–0.66). These results indicated that VF and VT, epinephrine administration, a physician-staffed ambulance, and PEA were contributing factors to ROSC, showing a similar trend as those obtained from the univariate analysis. Furthermore, the time from witnessing until recognition of the ROSC group was shorter by 1.8 min compared with that of the non-ROSC group, and the time from witnessing until CPR of the ROSC group was also shorter by 2.6 min .

The following three items strongly contributed to ROSC: “VF and VT by the initial ECG,” “epinephrine administration,” and “an ambulance staffed with a physician.” The percentage of VF and VT in the initial ECG was 13.6% herein, which was lower than those in studies conducted in the US and Europe . This suggests that there were more cases of asystole and PEA when cardiac arrest was witnessed in Japan, which may be one of the reasons why it is challenging to increase the possibility of ROSC. In addition, it is desirable to increase the probability of VF and VT detection.

Second, in Japan, epinephrine administration by an EMT was approved in 2006. Like the current study, epinephrine administration at an early stage has been reported to contribute to ROSC. Thus, seamless cooperation between prehospital emergency care and hospitals in each regional area is essential for the prompt administration of epinephrine.

Third, the present results revealed a physician-staffed ambulance contributes to ROSC. This system may have contributed to ROSC by increasing the types of medical activities, such as prompt basic life support and epinephrine administration at the site.

## **CONCLUSION**

The present study analyzed factors related to ROSC in OHCA cases. The results showed that “VF/VT”, “epinephrine administration” and “doctor-staffed ambulance” contributed to ROSC, which is a prerequisite of successful social rehabilitation. The importance of promptly performing CPR for VF and VT cases, the early administration of epinephrine, and the preparation of an emergency system in the community were shown to be essential to achieve ROSC in OHCA patients in a timely manner and subsequent social rehabilitation.