



## Guidelines for appropriate in-hospital emergency team time management: the Brooke Army Medical Center approach<sup>☆</sup>

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### Abstract

Successful outcome following cardiac arrest have been reported in the range of 13–59%. It is well established that the time from the onset of a ventricular arrhythmia to successful defibrillation predicts outcome. Recent out of hospital arrest protocols minimizing time to defibrillation have reported significant improvement in outcomes. The Bethesda conference and American Heart Association (AHA) both set standards for defibrillation time for in hospital codes but do not set standards for other interventions. In February 2000, the Brooke Army Medical Center (BAMC) cardiopulmonary resuscitation committee published time guidelines for the initiation of CPR, emergency team arrival, first defibrillation and first medication. We sought to evaluate resuscitation outcomes before and after this intervention. *Methods:* Data on each response time was prospectively collected as was etiology for the event, emergency location, patient age, gender, and emergency outcome for the 7 months prior to the guideline introduction and 15 months afterwards. *Results:* The mean response times (in minutes) for initiation of CPR (1.3 vs. 0.4), emergency team arrival (1.6 vs. 1.2), first defibrillation (7.8 vs. 6.6) and first medication (4.1 vs. 3.8) demonstrated trends toward improvement. Compliance with the time standards also increased (67–91, 85–95, 67–71 and 93–86%, respectively). Emergency survival trended toward improvement (47 vs. 57%) while discharge survival significantly increased from 3 to 24% ( $P = 0.017$ ). *Conclusions:* Setting time guidelines for Advanced Cardiac Life Support (ACLS) improved initiation of CPR, emergency team arrival, first defibrillation, and first medication administration. These time reductions were accompanied by improved event survival and a statistically improved survival to discharge. Published by Elsevier Ireland Ltd.

*Keywords:* Advanced life support; Guidelines; Resuscitation

### Resumo

Têm sido publicados resultados positivos da reanimação após paragem cardíaca em 13–59% dos casos. É sabido que o tempo desde o início de uma disritmia ventricular e a desfibrilhação bem sucedida tem valor prognóstico. A conferência de Bethesda e a American Heart Association (AHA) estabeleceram recomendações para o tempo até à desfibrilhação realizada pelas equipas de paragem intra-hospitalar mas não para outras intervenções. Em Fevereiro de 2000, a Comissão de Ressuscitação Cardiopulmonar do Brooke Army Medical Center (BAMC) publicou recomendações de tempo para o início de Manobras de Reanimação (CPR), chegada da equipa de paragem, 1ª desfibrilhação e 1ª medicação. Avaliámos os resultados das Reanimações antes e após esta intervenção. *Métodos:* Foram registados os dados sobre cada tempo de resposta assim como sobre a etiologia do evento, o local de estadia da equipa, a idade do doente, a raça e o resultado da actuação da equipa, durante os 7 meses prévios à introdução da recomendação e os 15 meses posteriores. *Resultados:* Os tempos médios de resposta (em min) para o início de CPR (1,3 vs. 0,4), chegada da equipa de paragem (1,6 vs. 1,2), 1ª desfibrilhação (7,8 vs. 6,6) e a 1ª medicação (4,1 vs. 3,8) mostraram tendência para melhoria. O cumprimento das recomendações do tempo também melhorou (67–91, 85–95, 67–71 e 93–86%, respectivamente). A sobrevida mostrou tendência para aumentar (47 vs. 57%) enquanto que a sobrevida à data de alta aumentou significativamente de 3 para 24% ( $P = 0,017$ ). *Conclusões:* O estabelecimento de recomendações para Suporte Avançado de Vida (ACLS) melhorou o início de CPR, a chegada da equipa de paragem, a 1ª desfibrilhação e a 1ª administração de medicação. Estas reduções de tempo foram acompanhadas por um aumento da sobrevida ao evento e um aumento com significado estatístico da sobrevida à data da alta. Published by Elsevier Ireland Ltd.

*Palavras chave:* Suporte avançado de vida; Recomendações; Ressuscitação.

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## Resumen

Se han reportado resucitación y resultados exitosos después de paro cardíaco en rango de 13–59%. Está bien establecido que el tiempo desde la instalación de una arritmia ventricular hasta la desfibrilación exitosa predice el resultado. Protocolos recientes, de paro extrahospitalario que minimizan el tiempo hasta la desfibrilación, han reportado mejoría importante en los resultados. Tanto la conferencia de Bethesda como la Asociación Americana del Corazón (AHA) establecen estándares para tiempo de desfibrilación para códigos intrahospitalarios pero no establecen estándares para otras intervenciones. En Febrero de 2000, el comité de reanimación cardiopulmonar del Centro Medico Brooke de la Armada (BAMC) publicó guías de tiempo para la iniciación de CPR, llegada del equipo de código, primera desfibrilación, primera medicación. Buscamos evaluar los resultados de resucitaciones antes y después de esta intervención. *Métodos:* Se recogieron prospectivamente los datos de cada tiempo de respuesta, etiología del evento, localización del código, edad del paciente, género, y resultado del código en los 7 meses previos a la introducción de las guías y 15 meses después. *Resultados:* El tiempo de respuesta promedio (en minutos) para la iniciación de CPR (1.3 vs.0.4), llegada del equipo de código (1.6 vs.1.2), primera desfibrilación (7.8 vs.6.6) y primera medicación (4.1 vs.3.8) mostraron tendencia hacia la mejoría. También mejoró la concordancia con los tiempos estándar (67–91, 85–95, 67–71 y 93–86%, respectivamente). La sobrevida del código tendió hacia la mejoría (47 vs.57%) mientras la sobrevida al alta mejoró significativamente desde 3 a 24% ( $P = 0.017$ ). *Conclusiones:* El establecer guías de tiempos para Soporte Vital Avanzado (ACLS) mejoró la iniciación de CPR, llegada del equipo de código, primera desfibrilación, y administración del primer medicamento. Estas reducciones en tiempos fueron acompañadas por sobrevida del evento mejorada y una mayor sobrevida al alta estadísticamente significativa.

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*Palabras clave:* Soporte vital avanzado (SVA); Guías; Reanimación; Resucitación

## 1. Introduction

An estimated 370 000–750 000 patients have in-hospital cardiac arrest and undergo attempted resuscitation annually [1]. The causes of cardiac arrest are numerous; by far the most common in adults is ischemic cardiovascular disease [2]. The arrest is usually associated with PEA or asystole with only 16–48% having ventricular tachycardia (VT) or ventricular fibrillation (VF) as the presenting rhythm [3,5,15,18]. Cardiac resuscitation in adults follows the same “chain of survival” concept whether it occurs in the community or in the hospital. Like emergency medical services (EMS), the hospital emergency team reacts and follows the “chain of survival” [4]. Most hospitals have designated emergency teams that are structured as small EMS units. Several studies have shown that medical centers with trained and designated emergency personnel have improved event and discharge survival [5]. Most of the improvement in survival was seen with response times of less than 3 min and return of circulation in less than 3 min. In 1998, the Joint Accreditation Commission on Healthcare Organizations (JCAHO) stated that hospitals should track resuscitation events for quality assurance, but made no recommendations on absolute times to initiation of cardiopulmonary resuscitation (CPR), emergency team response, first defibrillation or first medication administration. The American Heart Association (AHA) and Bethesda Conference on Emergency Cardiac Care recommend that hospitals should aim for a goal of delivering the first shock within 2 min of arrest determination in non-critical care areas [4,6]. However, no other reference by the AHA or other governing body states any expected times for these other measures. The Brooke Army Medical Center (BAMC) CPR Committee

in February 2000, published time guidelines for initiation of CPR, emergency team arrival, first defibrillation and first medication. The objective of this study was to determine compliance with these published standards and effects on emergency survival as well as survival to discharge.

## 2. Methods

This is a prospective review of all inpatient cardiac arrests or “Code Blues” at BAMC. We collected basic demographic data on each patient as well as the times to CPR initiation, emergency team arrival, first defibrillation (with ventricular arrhythmias) and first medication (with bradycardic and pulseless electrical activity events). The emergency team at BAMC is well established and is composed of two medical residents, two medical interns, anesthesia, respiratory therapy, a nursing supervisor, an ICU nurse, and chaplain. They are pre-assigned and carry designated pagers. The composition of the emergency team remained stable throughout the study period as did the number of emergency carts and distribution. No AED’s were in use during the study period. The physicians that comprise the team are ACLS certified, as is the ICU nurse. Other nursing personnel are drawn from the floor and all have at least BLS certification. The nursing personnel on the wards and in the ICUs were the primary witnesses for all events and initiated the emergency system.

BAMC is a moderate size, 450 bed, level one trauma center. The institution has annual outpatient visits of 640 000 per year. The hospital is arranged into two areas: an outpatient wing and inpatient wing with the ICU wards located between these two areas. The hospital has 184 operational beds with 48 ICU beds, 40 burn unit beds, and 134 ward

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