



## Simulation and education

## An assessment of resuscitation quality in the television drama *Emergency Room*: Guideline non-compliance and low-quality cardiopulmonary resuscitation lead to a favorable outcome?



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## ABSTRACT

**Objective:** Two earlier studies found that outcome after cardiopulmonary resuscitation (CPR) in the television medical drama *Emergency Room* (ER) is not realistic. No study has yet evaluated CPR quality in ER.

**Design:** Retrospective analysis of CPR quality in episodes of ER.

**Setting:** Three independent board-certified emergency physicians trained in CPR and the American Heart Association (AHA) guidelines reviewed ER episodes in two 5-year time-frames (2001–2005 and 2005–2009). Congruency with the corresponding 2000 and 2005 AHA guidelines was determined for each CPR scene.

**Patients:** None.

**Interventions:** None.

**Main outcome measures:** To evaluate whether CPR is in agreement with the specific algorithms of the AHA guidelines. Fisher's exact test and Mann–Whitney–U-test were used to evaluate statistical significance ( $P < 0.05$ ).

**Results:** A total of 136 on-screen cardiac arrests occurred in 174 episodes. Trauma was the leading cause of cardiac arrest (56.6%), which was witnessed in 80.1%. Return of spontaneous circulation occurred in 38.2%. Altogether, 19.1% of patients survived until ICU admission, and 5.1% were discharged alive.

**Conclusions:** Only one CPR scene was in agreement with the published AHA guidelines. However, low-quality CPR and non-compliance with the guidelines resulted in favorable outcomes.

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### 1. Introduction

Since Kouwenhovens' original description of modern cardiopulmonary resuscitation (CPR),<sup>1</sup> the techniques for CPR have been universally accepted, constantly improved, and internationally implemented as a standard of care for both out-of-hospital and in-hospital emergency medicine.<sup>2</sup> Through an intensive process over many years, scientific and evidence-based data on CPR are regularly cited, critically analyzed, and discussed by representatives of the International Liaison Committee on Resuscitation (ILCOR) to improve both the survival and outcome of patients.

These data are published in the *Consensus of Science Statements with Treatment Recommendations* (CoSTR) on an evidence-based level.<sup>3</sup> The ILCOR member organizations (e.g., the American Heart Association, AHA) subsequently published specific resuscitation guidelines that are consistent with the science in this consensus document.<sup>3,4</sup>

In the context of these consensus guidelines, CPR practice and CPR teaching should also be internationally uniform. Because only high-quality resuscitation, according to the guidelines' algorithms, provides the best evidence-based care for patients in cardiac arrest, it increases both survival and optimal neurological outcome after cardiac arrest.

Traditional media, such as television (TV), are powerful tools for disseminating health information and serve as the primary source of health information for millions of people.<sup>5</sup> In particular, lay

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persons and medical students gather medical knowledge presented on television.<sup>6–8</sup> The most important fictional medical TV drama with the highest number of viewers is *Emergency Room (ER)*, an American medical drama television series created by novelist and physician Michael Crichton.<sup>9</sup> A few earlier studies have analyzed the portrayal of resuscitation outcome in television series.<sup>6–8,10,11</sup> Concerning *ER*, previous studies have found that the outcome after resuscitation is not realistic, resulting in a discrepancy between TV and reality.<sup>6,7</sup> Thus far, no published studies have analyzed the quality of CPR shown on any television medical drama.

Therefore, the main goal of the present study was to analyze CPR scenes in the U.S. television medical drama *ER* according to the specific algorithms of the AHA guidelines for CPR. For detailed analysis, two hypotheses were tested. The first hypothesis was that CPR quality in the TV drama *ER* follows the guidelines of the AHA (2000<sup>12</sup> or 2005 guidelines<sup>13</sup>). The second hypothesis was that the quality of CPR found in the present study would explain outcome parameters after CPR.

## 2. Materials and methods

### 2.1. Data basis

*ER* is an American medical drama series that is primarily located in the emergency department of the fictional County General Hospital in Chicago.<sup>6</sup> The script was influenced by Michael Crichton's experiences in the emergency department as a young physician. The hospital scenes in *ER* occur on an exceptionally realistic set in which the medical team encounters emergency medicine cases ranging from drug overdoses and rape victims to motor vehicle crashes and gunshot wounds.<sup>14</sup> Each episode lasts for approximately 45 min. Beginning in 1994, a total of 15 seasons with a total of 331 episodes were broadcast on TV until the end of the series on April 2, 2009. Each TV season started in late September and ended in late May.

### 2.2. Data acquisition

We viewed all of the *ER* episodes during the 2001–2005 seasons (#8 to #12 [partly]) and the 2005–2009 seasons (#12 [partly] to #15), which were broadcast after publication of the AHA 2000 CPR guidelines<sup>12</sup> and the 2005 guidelines,<sup>13</sup> respectively, and before the 2010 guidelines. A total of 174 episodes in seasons #8 (broadcast start September 27, 2001) to #15 (broadcast until April 2, 2009) were analyzed for this study (Table 1). To identify relevant scenes, CPR was defined as previously reported in some other studies<sup>6,7</sup>:

- any situation with chest compressions on a patient,
- a patient was said to have an arrest,
- an unconscious patient was defibrillated for ventricular fibrillation (VF) or ventricular tachycardia (VT),
- clearly visible arrhythmias (e.g., asystolies) with known insufficient cardiac output.

### 2.3. Data analysis

In each episode of the entire study period, all of the CPR scenes were identified and analyzed according to the specific CPR algorithms.<sup>12,13</sup> As the standard of care for CPR, the specific *AHA Guidelines on Resuscitation* were used with the corresponding ILCOR universal/international ACLS algorithm valid in the year of the episode: seasons #8 to #12 [partly] (episodes #158 to #255) used the 2000 guidelines<sup>12</sup> and seasons #12 [partly] to #15 (episodes #256 to #331) used the 2005 guidelines.<sup>13</sup> Corresponding

guidelines were strictly applied by the first broadcasting date of the episodes.

Three independent, board-certified anaesthesiologists/emergency physicians trained in CPR and the AHA guidelines were responsible for data collection and data analysis. All three of the physicians carefully viewed the episodes independently. If necessary, repeated viewing was allowed until all of the required criteria were determined. The observers had to be in 100% agreement for the results to be recorded. If there was a discrepancy, a majority vote decided the recorded result. Depicted CPR scenes were classified as follows: (a) quality/correctness of the skills presented and (b) correct order of steps according to the algorithm. Epidemiological data, such as age and gender, were also recorded for each CPR scene, if detectable (Table 1). To assess CPR quality, the following parameters were recorded and analyzed: correct ventilation frequency [n/%], correct tidal volume [n/%], correct hand position [n/%], correct compression depth [n/%], and correct compression frequency [n/%]. Frequencies were determined by at least three consecutive actions. For the purpose of this study, a compression frequency of 95–105 min<sup>-1</sup> was accepted as in agreement with the guidelines.

### 2.4. Statistical analysis

The quality of CPR and concordance with the guidelines were rated according to the measurements presented in Table 1. As some aspects were not clearly identifiable for the viewers (e.g., a specific criterion was simply not shown during the CPR scene due to focus on the screenplay or an angle of vision prevented viewing the procedure clearly), some percentages do not total 100%.

Two AHA guidelines (AHA guidelines 2000<sup>12</sup> and AHA guidelines 2005<sup>13</sup>) were used for the analysis in the present study. Furthermore, patient characteristics and CPR quality were compared between these two groups to analyze changes over time. Fisher's exact test was used to compare proportions, and the Mann–Whitney *U*-test was used to compare the age distribution between periods. A *P*-value < 0.05 was considered to be statistically significant, although it was not corrected for multiple testing.

## 3. Results

A total of 136 (2001–2005 vs. 2005–2009, *n* = 82 vs. *n* = 54) on-screen cardiac arrests occurred in the 174 (*n* = 98 vs. *n* = 76) reviewed episodes of the TV medical drama *ER*. All of the patients were subjected to a CPR attempt and were therefore analyzed in detail (Table 1).

The median age of the resuscitated patients was 28 years (25 vs. 30 years), and 66% of patients were male (*n* = 90 of *n* = 136), and 34% were female (*n* = 46 of *n* = 136). Trauma was the leading cause of cardiac arrest (56.6%), followed by primarily cardiac causes (8.8%), infection (3.7%), hypothermia and electrolyte derangement (2.2% each), and intoxication (1.5%). The specific underlying cause of CPR remained unclear in 25% of the cases analyzed. Cardiac arrest was witnessed in 80.1% of the cases. Open cardiac massage was performed in 27 patients (19.9%), whereas 107 patients (78.7%) were definitively resuscitated by conventional CPR (2 inaccessible values).

The results of a subgroup analysis comparing the episodes of the 2000 and the 2005 guidelines are shown in Table 1.

### 3.1. Medical treatment

When CPR initiation was shown, initial ventilation before beginning chest compressions was performed in 15 patients (11.0%), whereas it was not performed in 23 patients (16.9%; missing data: *n* = 98). Endotracheal intubation was performed during the course

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