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Quality of Cardiopulmonary Resuscitation Depictions in Movies
Quality of CPR Depictions in Movies

Ibrahim SARBAY *[1], Goksu BOZDERELI BERIKOL [2], Ibrahim Ulas OZTURAN [3], Ismail SARBAY [4]

[1] Department of Emergency Medicine, Istanbul Gaziosmanpasa Training and Research Hospital, Istanbul, Türkiye.
[2] Department of Emergency Medicine, Ufuk University, Ankara, Türkiye.
[3] Department of Emergency Medicine, Kocaeli University, Kocaeli, Türkiye.
[4] Department of Thoracic Surgery, Sinop State Hospital, Sinop, Türkiye.

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ABSTRACT

Objective: Cardiac arrest is a leading cause of mortality and morbidity worldwide. While outcomes of in-hospital cardiac arrest have improved, it was not observed for out-of-hospital cardiac arrest cases. Bystander cardiopulmonary resuscitation (CPR) can increase survival rates. Improving CPR knowledge among the general public is the center of attention to increase bystander CPR rates and improve outcomes. CPR depictions in movies may have positive or negative effects on public knowledge about CPR. We aimed to analyze the CPR depictions in movies and evaluate their medical accuracy.
Materials and Methods: This study included "Feature Films" released between 01/01/1990 and 01/01/2023 presented in the IMDb movie database using the search function with the following keywords: *"Cardiac arrest", "cardiopulmonary resuscitation" (CPR), "resuscitation" and "CPR"*. A total of 113 movies with 125 CPR scenes were analyzed. Basic characteristics for each movie and scene were recorded. Compression Quality Score (CQS) was calculated for each scene. Four researchers analyzed each CPR scene for medical accuracy using checklists. If the CPR is performed on the scene without any errors the scene is evaluated as "Accurate". All decisions were taken unanimously.
Results: Victims were mostly male (70.4%), adults (78.4%), and suffered trauma (70.4%). The CPR performer was a bystander in 92 cases (73.6%). CPR was performed outdoors in 52 cases (41.6%). Only 28 scenes were interpreted as "medically accurate" (20.8%).
Conclusion: In this study, we found that CPR scenes in movies often do not accurately reflect how to perform CPR and may hinder the public perception of CPR.

Filmlerdeki Kardiyopulmoner Resüsitasyon Tasvirlerinin Kalitesi
Filmlerdeki CPR Tasvirlerinin Kalitesi

Makale Bilgisi

Makale Geçmişi
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Anahtar Kelimeler:
Kardiyopulmoner resüsitasyon (CPR),
Resüsitasyon kalitesi,
Filmler

ÖZET

Amaç: Kardiyak arrest dünya çapında mortalite ve morbiditenin önde gelen nedenlerinden biridir. Hastane içi kardiyak arrest sonuçlarında yıllar içinde iyileşme görülürken, hastane dışı kardiyak arest vakalarında bu gelişme gözlenmemektedir. Halkın CPR bilgisini geliştirmek, olay yerinde bulunan kişilerin CPR uygulama oranını artıracağı ve sonuçları geliştirebileceği için odak noktasıdır. Filmlerdeki CPR tasvirlerinin halkın CPR hakkındaki bilgisi üzerinde olumlu veya olumsuz etkileri olabilir. Bu çalışmada, filmlerdeki CPR tasvirlerini analiz etmeyi ve tıbbi doğruluğunu değerlendirmeyi amaçladık.
Gereç ve Yöntemler: Bu çalışmaya, IMDb film veri tabanında yer alan, 01/01/1990 ile 01/01/2023 tarihleri arasında yayınlanan "Uzun Metrajlı Filmler" arasından "Kardiyak arrest", "kardiyopulmoner resüsitasyon" (CPR), "resüsitasyon" ve "CPR" anahtar sözcükleri ile etiketlenenler dahil edildi. 113 filmden toplam 125 CPR sahnesi analiz edildi. Her film ve sahnenin temel verileri kaydedildi. Her sahne için bir Bası Kalite Puanı (CQS) hesaplandı. Dört araştırmacı, kontrol listelerini kullanarak her bir CPR sahnesini tıbbi doğruluk açısından analiz etti. Sahnede CPR hatasız olarak yapılmışsa, sahne "tıbben doğru" olarak değerlendirildi. Tüm kararlar oybirliğiyle alındı.
Bulgular: CPR uygulananların çoğunluğu erkek (%70,4), yetişkin (%78,4) ve travma geçirmiş (%70,4) kişilerdi. CPR uygulayıcısı 92 vakada (%73,6) sağlık profesyoneli olmayan kişilerdi. Vakaların 52'sine (%41,6) açık alanda CPR uygulandı. Yalnızca 28 sahne "tıbbi açıdan doğru" (%20,8) olarak yorumlandı.
Sonuç: Bu çalışmada, filmlerdeki CPR sahnelerinin genellikle CPR uygulamasını doğru şekilde yansıtmadığını ve CPR'nin kamuoyu algısını olumsuz etkileyebileceğini bulduk.

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***Corresponding Author:** Ibrahim Sarbay,
Department of Emergency Medicine, Istanbul Gaziosmanpasa Training and Research Hospital, Istanbul, Türkiye.
ibrahimsar@gmail.com

Introduction

Cardiac arrest is a leading cause of mortality and morbidity worldwide, with a poor survival rate in many countries (1,2). Out-of-hospital cardiac arrest (OHCA) occurs more than in-hospital cardiac arrest (IHCA). While outcomes of IHCA have improved in the past years, unfortunately, the same was not observed for OHCA cases (3).

Starting CPR early improves the chances of survival from cardiac arrest. Bystander cardiopulmonary resuscitation (CPR) can increase survival rates by two to three times (4). Studies have shown that the general public has a low level of CPR knowledge and lacks confidence in performing CPR (5). Therefore, it is important to improve public knowledge and awareness of CPR, and accurate portrayal of CPR in popular media such as movies and television can play an important role in improving OHCA outcomes (6). In a recent noninferiority trial study, it was concluded that online CPR training was not inferior to conventional training (7). In a study conducted among university students, the most common sources of information about CPR were television and movies (8). Inaccurate depictions of CPR in these mediums can lead to misunderstandings about the correct technique and effectiveness of CPR, which may deter bystanders from providing effective CPR in real-life situations (9).

The Internet Movie Database (IMDb) is one of the most popular online movie databases and hosts a wide variety of information about movies and television. The database contains user-generated keywords for movies, which number over ten million as of 2023 (10).

In this study, we aimed to analyze the CPR depictions in movies and evaluate their medical accuracy.

Materials and Methods

Study design

The IMDb movie database was used to select the movies for inclusion in the study. We searched the database using the keywords “cardiac arrest”, “cardiopulmonary resuscitation” (CPR), “resuscitation” and “CPR” for “Feature Films” released between 01/01/1990 and 01/01/2023. The flowchart of the study is presented in Figure 1.

Institutional review board approval was not required due to the nature of this study.

Study protocol

CPR was defined as “any situation in which chest compressions were performed on a patient, a patient was said to be having an ‘arrest’, or an unconscious patient was defibrillated for ventricular fibrillation (VF) or ventricular tachycardia.(6)

Unavailable movies, movies with CPR not performed on humans, and movies that don’t have any scenes that meet the CPR definition were excluded.

A researcher analyzed all included movies for depictions of CPR and noted basic characteristics for each movie and scene (Runtime, Country of Origin, Genres, Release Year, Timestamp of the CPR scene, Patient's Sex, Age, Etiology (Trauma or non-trauma), Disease, Intention of Humor, Location, Performer (Bystander or medical professional), Survival After CPR, Compression Rate, Depth, Location of the Compression, Rhythm, Defibrillation, Drugs, Interventions, Relative Witnessing CPR?, Relative Informed about CPR?, Intubation, Airway & Breathing, Fixation, Monitoring - where the first four characteristics collected directly from IMDb).

Since it is not always possible to determine the age of a character in a movie, we have followed the American Medical Association's age designations to broadly classify the ages of CPR patients (Children (1-12 years), Adolescents (13-17 years), Adults (18-64 years), Older adults (65 and older)) (11).

Average compression rates were measured using a metronome in cases where the practitioner or the patient is visible and compressions can be counted. Compression depths were measured if the patient's chest was clearly visible (one finger equating to 1.5 cm depth of compression (6)), and interpreted dichotomously (Right/Wrong).

"Compression quality" was also evaluated using the following criteria: Correct hand placement, compression rate of 100 to 120/min, compression depth, chest recoil, and minimizing interruptions in compression. Each section was awarded 1 point for correct performance, and a Compression Quality Score was calculated for each scene (out of 5 points).

Four researchers analyzed each CPR scene for medical accuracy using AHA's Basic Life Support Adult CPR and AED Skills Testing Checklist (for adults) (12) and PEARS® Child CPR and AED Skills Testing Checklist (for children) (13). Since the primary objective of our study was to evaluate whether the CPR scenes in the movies mislead the audience about CPR practice or not, it was assumed that the CPR steps that were not shown to the audience for artistic purposes and therefore could not be evaluated were performed correctly. If the depiction of CPR is clearly against the checklists, the scene is interpreted as "Not Accurate", and if the CPR is performed on the scene without any errors the scene is evaluated as "Accurate" (Figure 1). All decisions were taken unanimously.

Statistical analysis

The data were analyzed with the IBM SPSS Statistics Standard Concurrent User V 26 (IBM Corp., Armonk, New York, USA) statistical package program. Descriptive statistics are given as the number of responses (n), percentage (%), and mean ± standard deviation values. Normal distribution of the data of numerical variables was evaluated with the Shapiro Wilk normality test. In comparing two groups, independent samples

t test was used if the data were normally distributed, and Mann Whitney U Test was used if not. For variables with more than two categories, one-way analysis of variance (ANOVA) was performed if the data were normally distributed, and Kruskal Wallis H Test was used if the data was not normally distributed. A value of $p<0.05$ was considered statistically significant.

Results

125 scenes were identified in 113 movies. Descriptive statistics are presented in Table 1. The United States of America was the country of origin of 71 scenes (56.8%). There was no statistically significant difference between the movie origin and the CQS (Table 2). 2018 was the most frequent release year (10 movies – 8.85%), followed by 2009 and 2021 (9 movies each). While a wide variety of genres (17 in total) were observed, the most common movie genre was Drama (73 – 64.6%), followed by Thriller and Action (59 and 34, respectively). 5 scenes (4%) were intended to be humorous, and 6 scenes were in a Science-Fiction environment (4.8%). 51 (40.8%) of all CPR scenes appeared in the third part, 40 appeared in the middle part and 34 appeared in the first part of the movie.

88 victims (70.4%) were male. 98 victims (78.4%) were adults, while 10 were children, 8 were adolescents, and 9 were older adults. Trauma was the main etiology in 88 cases (70.4%). By far the most common cause of cardiac arrest was drowning (34 cases), followed by heart attack (9 cases). The CPR performer was a bystander in 92 cases (73.6%). CPR was performed outdoors in 52 cases (41.6%), followed by house and hospital (21 and 17, respectively).

22 of 32 CPRs performed by medical professionals were successful (68.75%), while 68 of 90 CPRs performed by bystanders were successful (75.56%). There was no statistically significant difference between CPR performer type and CQS variables (Table 3).

CPR was successful in 90 cases (72%) and 61 of them were male (67.78%). There was no statistically significant association between ROSC and CQS variables (Table 4). No compressions were performed in 25 CPRs (20%). Chest compression rates varied from 40 to 160 compressions per minute with a median of 100. The mean CQS was 3.13 ±1.48. In 17 cases, rhythm analysis could be seen on the monitor during the initiation of CPR (13.6%). 10 had asystole, 3 had normal sinus rhythm, 3 had Ventricular Fibrillation (VF), and 1 had pulseless electrical activity. Defibrillation was performed in 24 CPRs (19.2%). Precordial thump was delivered in 17 cases (13.6%), mostly by bystanders (76.47%), and mostly many times in succession (70.59%). In just one of these cases, the patient was in VF. Bag-valve-mask ventilation was performed in 19 cases (15.2%), while endotracheal intubation was performed only in 8 cases (6.4%). A relative of the victim was present in 21 cases (16.8%). Epinephrine was administered in 11 cases

during CPR (8.8%). Atropine was administered in 3 cases (3.4%). Naloxone and sodium bicarbonate were both administered once.

Only 28 scenes were interpreted as "medically accurate" according to the CPR checklists (20.8%). CPR was not indicated in 35 CPR scenes (28%). Medications or interventions were used wrongly in 27 CPR scenes (21.6%).

Discussion

Cardiac arrest poses a significant threat to public health, ranking among the deadliest health concerns (14). Since it may occur anywhere and timely intervention is vital, CPR Basic Life Support courses were introduced in the 1960s to increase bystander CPR rates (3,15). But despite the ongoing global efforts in CPR education for non-medical professionals, there is still room for improvement (5,15).

Since the introduction of motion pictures, which were thought to have the ability to "make one see and grasp things which only the cinema is privileged to communicate", there has been a desire in the medical community to use them for public education (16). Unfortunately, even productions designed to promote positive changes in public health were not always successful (17). A study conducted by Colwill et al. analyzed 30 episodes of 3 popular medical dramas and concluded that CPR was depicted inaccurately and these works may even hinder viewers' CPR knowledge with wrong messages (6). We have found that CPR attempts shown in the evaluated movies were mostly medically inaccurate, with a wide variety of wrong actions, some of which were possibly harmful or even fatal. Wrong indications for performing or stopping CPR, wrong use of medication or interventions, and wrong compression quality metrics were the most common of them.

In a study by Bray et al. it was found that the majority of OHCAs occurred in adults (96%), males (66%), and in private residences (76%) (18). In the present study, 108 cases were OHCA, and occurred in adults (85.2%), males (69.4%), and outdoors (48%). Most of the cases presumed medical aetiology (83%) in the aforementioned study, while trauma was the common aetiology (74.1%) for OHCA cases in ours.

Compression depth had a median of 3 cm (3.15-4.31) in Colwill et al.'s study (6). Since it is hard to precisely measure the compression depth in each scene, we have interpreted the results as right or wrong, and it was considered right in 52.6% of the scenes.

Bray et al. showed a 28% ROSC rate for OHCA cases who received an EMS-attempted resuscitation (18). In Colwill et al.'s study, ROSC was achieved in 62% of patients, and the quality of CPR did not affect the survival outcome (p=0.59) (6). In the present study, ROSC was achieved in 72% of all patients and bystander CPR had a higher success rate than CPR by healthcare professionals (75.56% and 68.75%, respectively). ROSC was not associated with CQS (p=0,058). Also whether

the CPR performer is a professional or bystander was not associated with CQS (p=0.20).

Precordial thump frequently appears in movies, mainly because of its dramatic effect. It was first described in the 1920s, and today it is recommended only for witnessed cardiac arrest of a patient who was monitored and had unstable ventricular tachycardia while a defibrillator is not available (19). While the clinical significance is controversial, some studies showed benefits. Pellis et al. concluded that precordial thump resulted in ROSC in 25% of patients (19-20). Precordial thump was used in 17 scenes (13.6%) which was evaluated in this study, usually by bystanders (13 scenes - 76.8%). Only in 2 of the cases, the patient was monitored before the use of the precordial thump. 12 of these instances resulted in ROSC (70.6%). These may lead to misconceptions in viewers' minds about its indications and effectiveness.

A report by the American Heart Association states that initial cardiac rhythm was VF, VT, or shockable by an automated external defibrillator in 16.6% of EMS-treated adult OHCAs, and VF or VT in 12.9% of IHCAs (21). In the present study, a monitor was used in 17 scenes (13.6%). Even though only 3 of these patients had a shockable rhythm (VF), 7 others also received defibrillation.

Conclusion

In this study, we found that CPR scenes in movies often do not accurately reflect how to perform CPR. The country of origin of the movies, performer type, or ROSC was not associated with the quality of chest compressions depicted in the movies. We believe that accurately portraying CPR in this widely consumed medium has a high potential for social benefit.

Limitations

Since we have included feature films listed on IMDB.com and tagged with specific keywords, some movies with CPR scenes may have been missed. Some movies were not available and were excluded from the study.

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Author contributions
Concept: I.S, I.S[4].
Design: I.S, G.B, I.U.O.
Supervision: I.S, G.B, I.U.O.
Resources: I.S, G.B, I.U.O, I.S[4].
Data Collection and Procesing: I.S, G.B, I.U.O.
Analysis and Interpretation: I.S, I.S[4].
Literature Search: I.S.
Writing Manuscript: I.S, G.B, I.U.O, I.S[4].
Critical Review: I.S, G.B, I.U.O, I.S[4].

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Table 1: Descriptive Statistics

		Statistics	
Country of Origin, *n* (%)	Other Countries	54	43.2
	USA	71	56.8
Part of the Movie, *n* (%)	First	34	27.2
	Middle	40	32.0
	Last	51	40.8
Sex, *n* (%)	Male	88	70.4
	Female	37	29.6
Age Category, *n* (%)	Older Adult	9	7.2
	Adult	98	78.4
	Adolescent	8	6.4
	Child	10	8.0
Aetiology, *n* (%)	Trauma	88	70.4
	Non-trauma	37	29.6
Humorous Purposes, *n* (%)	No	120	96.0
	Yes	5	4.0
Science-Fiction, *n* (%)	No	119	95.2
	Yes	6	4.8
CPR Performer, *n* (%)	Bystander	92	73.6
	Medical Professional	32	25.6
	Bystander&Medical Professional	1	0.8
ROSC, *n* (%)	No	35	28
	Yes	90	72
Compression Rate, *n* (%)	Wrong	67	53.6
	Right	58	46.4
Compression Depth, *n* (%)	Wrong	55	47.4
	Right	61	52.6
Recoil, *n* (%)	Wrong	13	10.5
	Right	111	89.5
Hand Placement, *n* (%)	Wrong	31	25.6
	Right	90	74.4
Minimizing Compression Interruptions, *n* (%)	Wrong	54	43.2
	Right	71	56.8
Rhythm, *n* (%)	Not available	108	86.4
	Asystole	10	8.0
	PEA	1	0.8
	VF	3	2.4
	Sinus	3	2.4
Precordial Thump, *n* (%)	No	108	86.4
	Yes	17	13.6
Shocks, *n* (%)	No	101	80.8
	Yes	24	19.2
Epinephrine, *n* (%)	No	114	91.2
	Yes	11	8.8
Atropine, *n* (%)	No	122	97.6
	Yes	3	2.4
Naloxone, *n* (%)	No	124	99.2
	Yes	1	0.8
Saline, *n* (%)	No	124	99.2
	Yes	1	0.8
Sodium Bicarbonate, *n* (%)	No	124	99.2
	Yes	1	0.8
Vascular access, *n* (%)	No	119	95.2
	Yes	6	4.8
Performed Interventions, *n* (%)	None	123	98.4
	Needle Thoracostomy	1	0.8

	Thermoregulation	1	0.8
CPR Witnessed by the Patient's Relative, *n* (%)	No	104	83.2
	Yes	21	16.8
Patient's Relative Informed About CPR, *n* (%)	No	118	94.4
	Yes	7	5.6
Intubation, *n* (%)	No	117	93.6
	Yes	8	6.4
Airway/Breathing, *n* (%)	None	103	82.4
	Bag-valve-mask	19	15.2
	Pocket Mask	1	0.8
	Face Mask	1	0.8
	Nasal Cannula	1	0.8
Tube Fixation, *n* (%)	No	120	96.0
	Yes	5	4.0
Monitoring, *n* (%)	No	103	82.4
	Yes	22	17.6
EMS Activation, *n* (%)	No	108	86.4
	Yes	17	13.6
Transfer, *n* (%)	No	105	84.0
	Yes	20	16.0
Checking Response, *n* (%)	No	72	57.6
	Yes	53	42.4
Providing Breaths, *n* (%)	No	20	16.0
	Yes	105	84.0
Defibrillation, *n* (%)	No	34	27.2
	Yes	91	72.8
Medically Accurate, *n* (%)	No	99	79.2
	Yes	26	20.8
Wrong Indication for Performing CPR, *n* (%)	No	90	72.0
	Yes	35	28.0
Wrong Use of Medication or Interventions, *n* (%)	No	98	78.4
	Yes	27	21.6
Total		125	100.0

n: Number of responses, *%:* Percentage value, mean and standard deviation. ROSC: Return of spontaneous circulation, CPR: cardiopulmonary resuscitation, USA: United States of America, PEA: Pulseless Electrical Activity, VF: Ventricular Fibrillation, EMS: Emergency Medical Services

Table 2: Comparison of Movie Origin and Compression Quality Score variables

	Country of Origin		Test Statistic	p
	Other	USA		
CQS	3,26±1,33	3,03±1,58	-0,615	0,538£

Numerical variables are given as mean±standard deviation. £: Independent samples t test, £Mann-Whitney U test, CQS: Compression Quality Score

Table 3: Comparison of CPR performer type and Compression Quality Score variables

	CPR Performer			Test Statistic	p
	Bystander	Medical Professional	Bystander&Medical Professional		
CQS	3,20±1,49	2,88±1,43	5,0±0	3,222	0,200 €

Numerical variables are given as mean±standard deviation. £: One-way ANOVA , € Kruskal-Wallis test, CQS: Compression Quality Score

Table 4: Comparison of ROSC and Compression Quality Score variables

	ROSC		Test Statistic	p
	No	Yes		
CQS	3,56±1,10	2,94±1,56	-1,896	0,058£

Numerical variables are given as mean±standard deviation. £: Independent samples t test. £Mann-Whitney U test, ROSC: Return of spontaneous circulation, CQS: Compression Quality Score

Figure 1. The flowchart of the study