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Original article

Influences of "do-not-resuscitate order" prohibition on CPR outcomes☆

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ABSTRACT

Objectives: The aim of the study is to determine factors affecting the return of spontaneous circulation (ROSC) ratios, neurological outcomes at discharge, the ratio of living patients discharged from the hospital and due to Do not attempt resuscitation (DNAR) prohibition.

Material and methods: This is a retrospective observational study conducted on patients of cardiopulmonary resuscitation (CPR) performed in emergency department (ED) and intensive care units between February 2010 and February 2012.

Results: A total of 469 patients were evaluated, and 266 eligible patients who did not have DNAR orders were included in the study. Overall, 45.1% of the adult in-hospital cardiac arrest victims returned to spontaneous circulation, and 5.3% survived to hospital discharge. Of the patients who were discharged alive from the hospital, 33.3% were discharged in poor neurologic conditions of Cerebral Performance Category (CPC) score 3 or 4. The ROSC ratio was reduced for the patients with malignancies compared to the patients with other preexisting conditions (OR: 12.783; 95% CI 2.967–55.072; p = 0.000). None of the patients with malignancies were discharged alive from the hospital. Only one patient with end-stage disease was discharged alive from hospital, and this patient's CPC score was 4.

Discussion and conclusion: CPR has not increased the ROSC and alive discharge rates in patients with malignancy and end-state disease. DNAR order prohibition have been increased the futile CPR attempts. DNAR should be accepted as a human right that represents an honorable death option and whether a DNAR is order demanded should be specifically discussed with patients with malignancies and end-stage disease presenting to ED.

1. Introduction

Cardiopulmonary resuscitation (CPR) is used to treat cardiac arrest and it is often an attempt performed in ED. Successful CPR attempts may result in living discharged from the hospital and healthy lifestyles for patients; however, for many patients, the outcomes are poor.[1,2] Performing an invasive and unsuccessful CPR procedure can lead to persistent vegetative state and potentially prolong suffering.[1–4] Moreover, CPR is occasionally unsuccessful in terms of prolonging life at an acceptable level of quality. Futilely applying CPR to patients is a problem that leads to the consumption of health resources.[2,4,5] Increases in the number of CPR attempts are associated with increased consumption of health resources.[6]

Do not attempt resuscitation (DNAR) means that CPR should not be performed at the beginning of or during cardiac or respiratory arrest.[2,4,5] Alternative naming and abbreviations are used to communicate this order in different countries. Do not resuscitate (DNR) is one of the widely used abbreviations in many countries. However, do not attempt resuscitation (DNAR) and do not attempt cardiopulmonary resuscitation (DNACPR) are abbreviations that are used in the USA and some areas of the UK and are more clear and descriptive.[2,4] Some countries have advocated that these orders be re-termed "allow natural death",[7] and some have advocated for the use of not for resuscitation (NFR). Other synonymous terms include "not to be resuscitated" (NTBR) and "no code".[8]

☆ This study was record to clinicaltrials.gov. The ID for clinicaltrials.gov was NCT02585050.

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The application of DNAR orders remains a controversial subject. While DNAR orders are officially applied in some countries, they are strictly forbidden and considered criminal offences in other countries.[1,2] To the best of our knowledge, a comprehensive study investigating the effects of DNAR order prohibition has not yet been conducted.

The aim of this study is to determine the influences of DNAR order prohibition on CPR outcomes and the living discharge ratios from hospital.

2. Methods

2.1. Study design and setting

We conducted a retrospective chart review of CPR performed in emergency department (ED) and intensive care units between February 2010 and February 2012 at a 180-bed rural city hospital. The bed capacities of the hospital in the ED, ICU, coronary care unit (CCU) are 10, 6 and 10, respectively. Approximately 450,000 patients are annually admitted to this hospital, 122,000 patients are admitted to ED, 1800 patients are hospitalized in wards, and 500 patients are hospitalized in intensive care units.

The CPR team at this hospital includes a specialist team leader who is an emergency department physician during the day shifts (defined as 8:00 to 15:59) who is an anesthesiologist or other specialists during the night shifts (defined as 16:00 to 07:59) and a nurse, a wheeled stretcher employee, a security officer. A form termed the CPR call form is completed by the leader of the CPR team at the end of all calls. These forms are filed in the hospital archive in chronological order. The hospital uses the resuscitation guidelines from the American Heart Association,[2] and all healthcare providers of the CPR team are certified in basic cardiac life support (BCLS) and advanced cardiovascular life support (ACLS). All CPR attempts are performed according to these standards.

2.2. Study population

The data were collected from the CPR call forms and hospital medical records. All data were noted by using the Utstein-style reporting template and included the demographic data (date of birth/age and gender), date of arrest, time of first CPR attempt, etiology, preexisting conditions, location of arrest, arrest witnessed (a witnessed cardiac arrest is one that is observed or heard by another person or an arrest that is monitored), initial rhythm, duration of CPR attempt, end of event, date of discharge or death and neurological outcomes at discharge from the hospital.

2.3. Inclusion and exclusion criteria

Four hundred sixty-nine CPR call forms were filled over the 2-year period. Adult patients (age $\geq$18 years) who experienced CPR attempts in ED and intensive care units due to cardiac arrest were eligible for inclusion. Patients below 18 years of age, calls performed due to code blue drills, missing calls, patients with more than one cardiac arrest, patients with CPR attempts that began outside the hospital and patients with missing the data in hospital medical records were excluded from the study (Fig. 1).

CPR attempts were defined as an attempt to restore spontaneous circulation by performing chest compressions with or without ventilation. ROSC (return of spontaneous circulation) was defined by a status in which spontaneous circulation was sustained for at least 20 min.

Neurological outcomes at discharge were determined with a Cerebral Performance Category (CPC) score based on the last neurological examination of the patients before discharge.

CPC scores of 1 or 2 were considered good neurological outcomes, and CPC scores of 3 and 4 were considered poor neurological outcomes. Last phase in the course of a progressive disease was determined as end-stage disease.

2.4. Statistical analysis

The continuous variables are expressed as the mean ± standard deviation (SD). The categorical data are expressed as percentages. Chi-square tests were used for the univariate analyses of categorical variables. All the findings were presented by using a 95% Confidence interval (95% CI). The data were analyzed with SPSS v. 17.0. Statistical significance was defined as $p < 0.05$.

This study was record to clinicaltrials.gov and the ID for clinicaltrials.gov was NCT02585050.

3. Results

We evaluated 469 CPR call forms, and 203 patients were excluded for a variety of reasons (Fig. 1). Ultimately, the 266 eligibility patients that received CPR attempts in-hospital for whom DNAR orders were not applied were included in study. Baseline characteristics of the patients are summarized in Table 1 Of the 266 patients in the scope of the study, 124 (46.6%) patients were female, and 142 (53.4%) patients were male. A total of 114 (42.9%) of the patients were under 55 years old, and 152 (57.1%) patients were over 55 years old (mean: 65.1 ± 13.7). There were 120 (45.1%) patients with sustained ROSC, 146 (54.9%) patients with unsuccessful ROSC after CPR attempts, and 14 (5.3%) patients who were alive when discharged from the hospital. The outcomes recorded for all categories are reported according to the Utstein template in Table 2. The CPCs scores at discharge from the hospital were 1 or 2 for 8 (66.7%) of the 14 patients and 3 or 4 for 4 (33.3%) of the 14 patients; 2 (14.3%) of the 14 patients' CPC scores were not known (Table 3).

Regarding the preexisting conditions, 26 (89.8%) of the total 28 patients for whom ROSCs were applied had malignancies. The ROSC ratio for the patients with malignancy was reduced compared to that of the patients with other preexisting conditions (OR: 12.783; 95% CI 2.967–55.072; $p = 0.000$; Table 4). None of the patients with malignancies were discharged alive from the hospital. Preexisting malignancies significantly reduced survival to hospital discharge ($p = 0.000$, Table 5). In 44 (89.8%) of the 49 (18.4%) patients with end-stage disease, ROSCs did not occur. In the patients with preexisting end-stage diseases, the ROSC ratio was significantly reduced (OR: 12.921; 95% CI: 4.491–37.176; $p < 0.001$; Table 4). Only one (2.4%) patient with end-stage disease was discharged alive from the hospital, and this patient's CPC score was 4. Preexisting end-stage diseases significantly reduced survival to hospital discharge compared with other preexisting conditions ($p = 0.000$; Table 5).

4. Discussion

While DNARs are officially used in some countries, such as the USA, Hong Kong, the United Kingdom (UK), Norway, Sweden, Finland, Germany, Slovenia, and Sweden, they are not currently legal in other countries. In Turkey and Israel, DNARs are strictly forbidden.

There is no specific provision regarding DNAR order in the Turkish Penal Code. However, a physician who performed DNAR order come into the same group with a physician who performed the passive euthanasia and legal responsibilities will be similar (Supreme Council of Health decision and Criminal Court of Appeals 4th Department of decision). According to Legislative Decree law No. 181 Article 13, Euthanasia (passive and active) is prohibited and

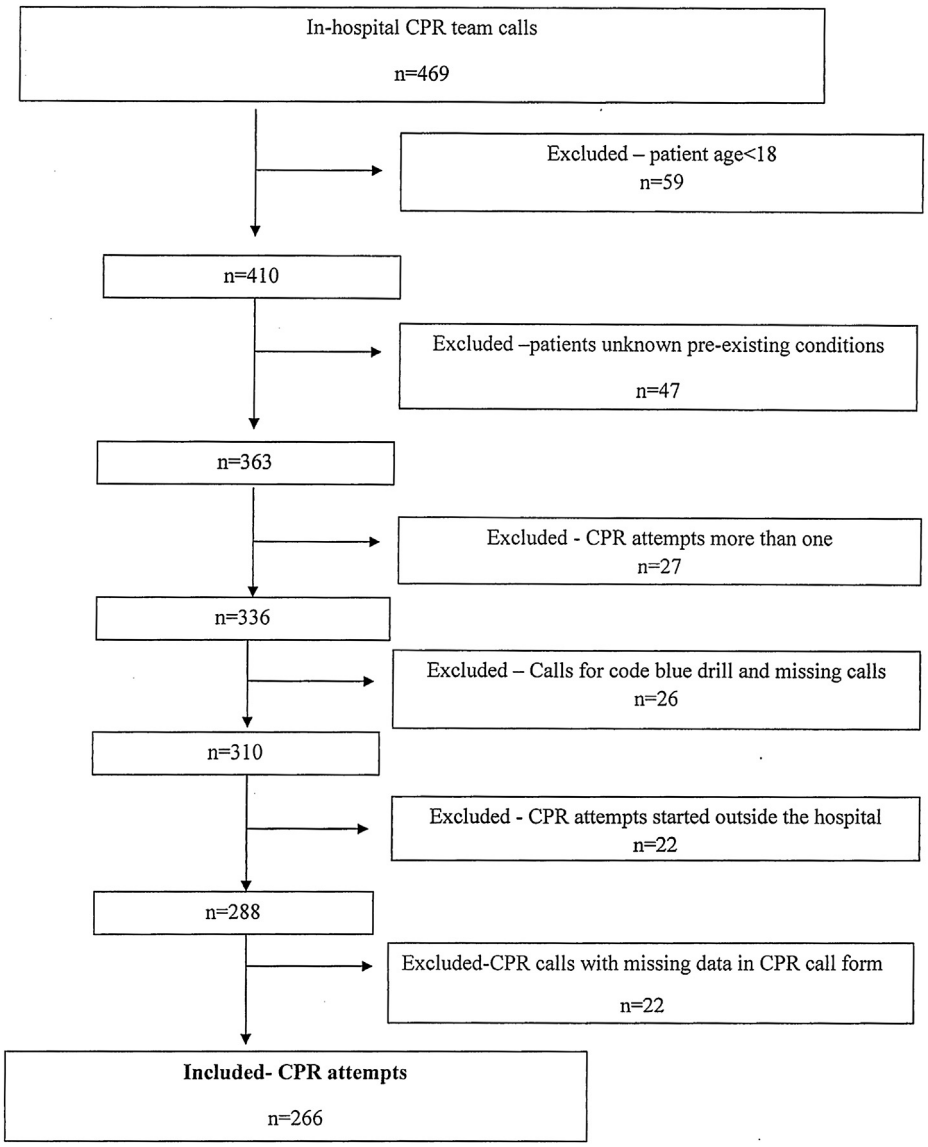

Fig. 1. Flow diagram for inclusion of participants.

Article 14: "Even if it is not possible to save the patient's life or preserve the health physician must relieve or reduce his/her suffering." Physician Ethical Rules Article 28, which is prepared based on 6023 Law No. 59/g, state that "Physicians must strive to reduce the suffering to make any kind of humanitarian aid and to provide conditions worthy of human dignity for patients in the terminal stage".[9]

In some countries, for example Poland, Belgium, Spain, and Hungary, whether DNAR orders are official vary across the country, and different practices are used in different regions of these nations. There are no official instructions or policies regarding DNARs in Denmark, Holland, France, Portugal, Austria, Croatia or Greece.[5,10]

Studies have been conducted in countries in which DNAR order policies are official and legal and have presented the CPR outcomes with ROSC and survival to hospital discharge rates. In the United Kingdom, the overall rates of ROSC and survival to hospital discharge are 45.0% and 18.4%, respectively,[11] and a similar report from the USA revealed that overall, 44% of adult in-hospital cardiac arrest victims have ROSCs, and 17% of these patients survive to hospital discharge.[12] Another study conducted in Germany reported that the overall rates of ROSC and survival to hospital discharge were 72.3% and 42.5%, respectively.[13]

Studies have also been conducted in countries without formal arrangements for DNARs. In Portugal, the ROSC rate and alive discharge ratio are 30% and 11%, respectively.[14] In Iran, the successful ROSC ratio and alive discharge rate are 32.8% and 12%, respectively.[15] Another study conducted in Turkey, in which DNAR orders are illicit and criminal offenses, found that ROSC was achieved in 27.2% of the patients, and among these patients, 10% were discharged from hospital.[16] In the present study, the ratios, ROSCs and alive discharge rates were lower than those in countries in which DNAR orders are routinely applied.

Few studies have investigated the effects of DNAR order application on the rates of ROSC and alive discharge from the hospital. Some studies have revealed that overall survival to discharge ratios are higher when DNAR orders are exercised.[1,17] An investigation by Nieman et al[18] noted that when DNAR patients are excluded, the SHD is 6.1%, which represents a 15% increase in the SHD rate.

It is thought that DNARs are often ordered by cancer and critically ill patients.[19] DNAR orders are controversial in cancer care, and

Table 1
Baseline characteristics of the patients.

	Total (N = 266)	%
Gender		
Female	124	46.6
Male	142	53.4
Age (years), mean ± SD: 65.1 ± 13.7 (range: 44–98 years)		
≥55	152	57.1
<55	114	42.9
Etiology		
Presumed cardiac	178	66.9
Respiratory	60	22.6
Other non cardiac	20	7.6
Trauma	6	2.3
Unknown	2	0.6
Pre-existing conditions*		
COPD	86	32.3
Malignancy	28	10.5
Cerebrovascular disease	52	19.5
Chronic renal failure	18	6.8
Heart failure	34	12.8
Ischemic heart disease	46	17.3
Hypertension	128	48.1
Diabetes	65	24.4
End stage disease	49	18.4
Time of arrest		
Morning (07:00–17:00)	104	39.1
Evening and night (17:00–07:00)	162	60.9

Table 2
In-hospital Utstein template for the reporting of outcomes recorded for all categories.

Outcome recorded for all categories	N	%
ROSC		
Yes	120	45.1
No	146	54.9
Survived event	106	39.9
Discharged alive	14	5.3
Neurological outcome at discharge		
CPC 1 or 2	8	57.1
CPC 3 or 4	4	28.6
Unknown	2	14.3

debates regarding CPR attempts for cancer patients are still ongoing. While some believe that CPR should not be initiated if treatment is futile and the patient does not want CPR attempts according to some opinions,[2,4] others, particularly those with certain religious beliefs, state that resuscitation should not be the patient's choice and that CPR should be performed for all patients who experience cardiac arrest, regardless of the patient's preference.[1,9,20] In this study, we showed that CPR has not increased the ROSC and discharge rates in patients with malignancy and end-stage disease. CPR is a time-consuming, strenuous and costly practice. Increases in the number of futile CPR attempts is associated with wasted emergency staff's time in ED.[19,20] DNAR order prohibition can cause futile CPR attempts and the consumption of effort and time in ED and critical care units. The four key principles regarding CPR and end-of-life decisions are beneficence, non-maleficence, justice and autonomy. Non maleficence means doing no harm. Resuscitation should be attempted in futile cases. Autonomy relates to patients being able to make informed decisions on their own behalf, rather than being subjected to paternalistic decisions being made for them by the medical or nursing professions.[2] We argue that DNAR should be accepted as a human right that represents an honorable death option and whether a DNAR is order demanded should be specifically discussed with patients with malignancies and end-stage disease presenting to ED.

The alive discharge rates and neurological statuses of patients with DNAR orders who received CPR are not exactly known. There are some studies in the literature, but the majority of these studies have not reported satisfactory data regarding CPC scores at the time of discharge from hospital. One study reported that a total of 86.9% of the participants, among whom 2.3% were cancer patients, approved DNAR orders and declared that only one patient with cancer was discharged alive from the hospital, but this study provided no information about the CPC scores or the neurological outcomes.[21] In another study, 82% of the participants and 47% of the patients with cancer approved DNAR orders, and 12% of the cancer patients who experienced CPR events were not discharged alive.[22]

Table 3
CPC scores of the patients who were discharged alive from the hospital according to pre-existing disease.

Variables*	Discharged alive (N = 14)	CPC score 1 or 2 (N = 8)	CPC score 3 or 4 (N = 4)	Unknown (N = 2)
COPD, % (n)	28.6 (4)	50 (2)	25 (1)	25 (1)
Malignancy, % (n)	–	–	–	
Cerebrovascular disease, % (n)	14.3 (2)	50 (1)	50 (1)	
Chronic renal failure, % (n)	21.4 (3)	66.7 (2)	–	33.3 (1)
Heart failure, % (n)	14.3 (2)	100 (1)	–	
Ischemic heart disease, % (n)	14.3 (2)	50 (1)	50 (1)	
End stage disease, % (n)	7.1 (1)	–	100 (1)	

*Variables with multiple responses.

Table 4
Pre-existing conditions associated with ROSC after CPR.

Pre-existing conditions*	Any ROSC		P-values	OR (95% C.I.)
	Yes	No		
COPD (ref other), % (n)	48.8 (42)	51.2 (44)	0.431	0.801 (0.478–1.341)
Malignancy (ref other), % (n)	92.9 (2)	7.1 (26)	0.000	12.783 (2.967–55.072)
Cerebrovascular disease (ref other), % (n)	34.6 (18)	65.4 (34)	0.090	1.720 (0.915–3.234)
Chronic renal failure (ref other), % (n)	44.4 (8)	55.6 (10)	0.953	1.029 (0.393–2.696)
Heart failure (ref other), % (n)	41.2 (14)	58.8 (20)	0.621	1.202 (0.579–2494)
Ischemic heart disease (ref other), % (n)	58.7 (27)	41.3 (19)	0.051	0.515 (0.270–0.982)
Hypertension (ref other), % (n)	43.8 (56)	56.3 (72)	0.667	1.112 (0.686–1.804)
Diabetes mellitus (ref other), % (n)	49.2 (32)	50.8 (33)	0.443	0.803 (0.459–1.407)
End stage disease (ref other), % (n)	10.2 (5)	89.8 (44)	0.000	12.921 (4.491–37.176)

*Variables with multiple responses.

Table 5
Pre-existing conditions and survival statuses following CPR.

Pre-existing Conditions*	Total % (N)	No ROSC % (N)	ROSC but died % (N)	Survival to discharge % (N)	P values
COPD	32.3 (86)	51.2 (44)	39.6 (34)	9.3 (8)	0.173
Malignancy	10.5 (28)	92.9 (26)	7.1 (2)	–	0.000
Cerebrovascular disease	19.5 (52)	65.4 (34)	30.8 (16)	3.8 (2)	0.116
Chronic renal failure	6.8 (18)	55.6 (10)	33.3 (6)	11.1 (2)	0.516
Heart failure	12.8 (34)	58.8 (20)	35.3 (12)	5.9 (2)	0.180
Ischemic heart disease	17.3 (46)	41.3 (19)	52.1 (24)	6.5 (3)	0.109
Hypertension	48.1 (128)	56.3 (72)	38.3 (49)	5.5 (7)	0.818
Diabetes mellitus	24.4 (65)	50.8 (33)	27.7 (18)	21.5 (14)	0.268
End stage disease	18.4 (49)	89.8 (44)	8.1 (4)	2.1 (1)	0.000

*Variables with multiple responses.

The largest study to date, which involved 49,130 cases of in-hospital cardiac arrest, was conducted by Larkin et al.[23] In this study, 11.2% of the patients had metastatic or hemostatic malignancies, and 92.2% of the metastatic and malignant patients were not discharged alive.

A study conducted on cancer patients with cardio-pulmonary arrest who were admitted to the ICU reported that only 26% of the patients were discharged from the ICU, and 75.9% of the patients' CPS score were 3–4.[24] This study revealed that the lowest ROSC and alive discharge rates occurred in patients with cancer and end-stage diseases. Only a single patient with malignancy and end-state disease was discharged alive from the hospital, and that patient was in a neurologically persistent vegetative state. Even following positive responses to CPR attempts in patients with cancer and end-stage disease, the patients and relatives may have to suffer from the neurological impairments that may result in patients being bedridden or in permanent comas following discharge, and these factors should be considered. We suggest that success rates following CPR attempts should be determined according to not only discharge rates but also the patient's neurologic status, and the latter factor should be considered in terms of the patient's survival after discharge.

5. Limitation

This study has some limitations. This is a single-center study and results may not be generalized to other locations. Because this study was conducted in a country in which DNAR orders is forbidden strictly, the control group which DNAR order applied could not be created. Therefore, data outcome between cases with and without DNAR in same hospital could not be compared. In addition, there are many factors affected ROSC and alive discharge rates. However, we only examined the effects of DNAR order that is not implemented on these ratios. Further studies are needed for a more detailed description the effects of DNAR order prohibition.

6. Conclusions

This study revealed that the lowest ROSC and alive discharge rates occurred in patients with cancer and end-stage diseases. CPR attempts in these patients were typically ineffective and futile CPR attempts. DNAR order prohibition can cause futile CPR attempts. Futilely applying CPR to patients is a problem that leads to the consumption of time, money and effort. Thus, DNAR order prohibition can lead wasted time and may not allow more time for patients who will truly benefit from CPR in EDs and critical care units. Whether a DNAR is order demanded should be specifically discussed with particularly patients with malignancies and end-stage diseases in ED and intensive care units. In countries in which DNAR order are not authorized, the immediate creation of legislation will be beneficial to the patients, relatives and their healthcare system. In addition, because patients who survive in persistent comas following CPR may cause tragedy for the patients and their relatives, the success of CPR attempts should not only be specified by the rate of alive discharges but also by the CPC scores which reflect neurological outcomes at discharge.

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Author's contribution

Each of the authors contributed to the research, data analyses and writing. All authors read and approved the final manuscript.

Conflicts of interest

The authors declare that they have no competing interests.

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