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Title: The end-of-life conundrum: do-not-resuscitate order rates and their determinants in a teaching hospital in Saudi Arabia

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ABSTRACT

Background: With the increment in critical care over the last few decades, the outcome and prognosis of patients has significantly improved in many aspects. Cardiopulmonary resuscitation has been a setting stone in these endeavors. However, in many clinical cases reviving patients is not in their best interest, especially when the treatment is determined to be futile. The introduction of do-not-resuscitate (DNR) orders in critical care helps to avoid unnecessary patient suffering. **Methods:** We aimed to demonstrate the rates of DNR orders in King Fahd Hospital of the University in the Eastern Province of Saudi Arabia and to highlight the related determinants. Two hundred and nineteen intensive care unit (ICU) admissions from August 2016 to December 2018 were analyzed. Age, gender, nationality, and diagnostic categories were all compared with the DNR rates in both surgical and medical ICUs. **Results and Conclusions:** This study highlights the determinants influencing the rates of DNR orders in a public teaching hospital in the Eastern Province of Saudi Arabia. DNR order was issued for 9.6% patients out of 219 adult patients in both ICUs. Oncological conditions were shown to be significantly associated with higher DNR rates, which can be attributed to advanced stages of disease and metastasis. Our research was conducted in a single-center university-affiliated public teaching hospital. Further, prospective multi-centered studies are urged to capture a more comprehensive view of DNR determinants and patients' characteristics in this region.

Keywords: Medical ethics; cardiopulmonary resuscitation; do-not-resuscitate; DNR rate; Middle East; Saudi Arabia

Introduction

Cardiopulmonary resuscitation (CPR) on ill patients whose death is inevitable often results in undesirable outcomes such as prolonging patients' terminal illness, increasing families' anxiety and financial burden. Not until the 1970s, the do-not-resuscitate (DNR) order was introduced into practice to reduce the suffering of terminally ill patients.[1] DNR is a medical order that directs towards withholding resuscitation in cases of cardiac and pulmonary arrest. It is employed in clinical settings where further treatment may only prolong patient and family suffering without anticipated benefit.[2] Identifying and recognizing factors when considering DNR orders is of significant importance. Such factors can influence the rates of DNR orders issued.

Several studies have addressed the association of medical and demographic factors to DNR directives. A study conducted in China by Huang et al. reported a prevalence of 80% of DNR directives among terminal cancer patients, with the most common type of malignancy being pulmonary.[3] Huang et al. attributed this to the evident symptomatology of pulmonary diseases that hinder the patients' quality of life.[3] A systematic review conducted by Cook et al. showed that advanced age was associated with higher rates of DNR orders in the United Kingdom.[4] Contrastingly, Cheng et al., in another study, reported no significant influence of patients' demographics on DNR rates.[5]

There appear to be significant gaps in the related data analysis within Saudi Arabia, especially from the Eastern Province. We have previously published a questionnaire-based survey on the attitudes of physicians towards DNR directives.[6] Here, we aim to report the rates of DNR orders in King Fahd Hospital of the University, a public teaching hospital, in the Eastern Province of Saudi Arabia and to highlight the related determinants.

Methods

Study stetting

The present study was conducted at King Fahd Hospital of the University, a teaching hospital of the College of Medicine affiliated with Imam Abdulrahman Bin Faisal University, Dammam, Eastern Province, Saudi Arabia. With the collaboration of the Medical Records Department, the intensive care unit (ICU) admission lists from August 2016 to December 2018 were obtained retrospectively. A total of 219 patient admissions constituted our sample. The data were collected from each patient's hospital file throughout this period.

This study was undertaken after obtaining approval from the Institutional Review Board (IRB) at Imam Abdulrahman Bin Faisal University.

Variables

The following data were collected as independent variables: patient demographics, such as age, gender, nationality; and clinical data, such as admission diagnosis, presence of cancer, type of intensive care unit (ICU), and DNR status. The Acute Physiology and Chronic Health Evaluation (APACHE) II is a measurement of illness severity used within our facility and is one of the most commonly used ICU scoring systems.[5] We found it to be most appropriate for the study due to the inclusion of surgical and medical ICUs with patients across many specialties. Its 50 diagnostic categories were narrowed into 6 main categories: respiratory, cardiovascular, neurological, gastrointestinal, polytrauma, and others.

Data management and analysis

The statistical package for social sciences (SPSS version 22.0, SPSS Inc, Chicago, IL) was used in data analysis. Patient data were evaluated via frequencies and percentages for all categorical variables, while the mean and standard deviation were used for continuous variables. The association between DNR status of patients, their demographics, and clinical data were analyzed using chi-square test. P-value of significance was taken to be < 0.05.

Results

Patients' characteristics

The databases of the medical and surgical ICUs were used to retrospectively collect the clinical data and demographics of a total of 219 patients, of which 53% were from the medical ICU and 47% were from the surgical ICU. The mean age was 59.82 ± 19.2 years. Approximately half of the patients were females (51.6%), and predominantly Saudis (79%). DNR order was issued for 9.6% patients. Cancer patients accounted for 7.8% of the total admissions. The diagnoses that attributed to the majority of admissions were neurological, with a total of 20.5% patients. Other unclassified reasons of admission collectively accounted for 35.6% (Table 1).

Factors associated with DNR

The correlation between the patients' DNR status and their characteristics is shown in Table 2. An association between cancer and DNR orders was found to be significant (chi=14.047, p=0.002) with 35.3% of the cancer patients having a DNR issued. Although a higher proportion of females had DNR orders issued, gender yielded no significant association with DNR status. Additionally, nationality, reason of admission to ICU, and type of unit were

not significantly associated with DNR status.

Discussion

The DNR rate of our patient sample was comparable to the results of other similar studies. We found the rate of DNR orders in the ICUs of a teaching hospital in the Eastern Province of Saudi Arabia from August 2016 to December 2018 to be 9.6%. Similarly, Marco et al., Tseng et al., and Chen et al. reported rates of 8%, 11%, and 11.3%, respectively in studies conducted in the US and Taiwan.[7-9] On the other hand, studies investigating DNR among terminally ill oncological patients reported much higher rates, reaching 80%.[3]

Age

Cook et al. reported higher rates of DNR with advanced age.[4] However, they did not exclusively attribute this result to ageism but pointed that it can signify that these decisions are appropriate when putting other factors into consideration. Another study addressing intracranial hemorrhage patients have similarly reported a strong association between advanced age and DNR decision.[10]

Our results demonstrated similar DNR rates among different age groups; 33.3% were below 50 years, 23.8% were 50-60 years, and 42.9% were above 65 years. Likewise, Cheng et al. illustrated that patient demographics held no significance on DNR rates.[5]

Medical and surgical ICUs

The combination of both databases provided a more diverse sample to represent adult ICU patients more broadly. Though the number of issued DNR within the surgical ICU was 12.6%, compared to 6.9% in the medical ICU at the same time frame, it did not yield statistical significance (chi = 14.047, p=0.151). Likewise, a Tunisian study showed that there was a similarity in the number of end-of-life decisions between medical ICU and surgical ICU despite the sharp differences between the patients in terms of severity and prognosis in their study. This might be owed to similarities of practice, culture, ethical and legal aspects between the two countries, in spite of the clinical difference between surgical and medical patients.[11]

Cancer status

Over a third (35.3%) of those with DNR orders in our study were cancer patients (chi = 14.047, p=0.002) which is statistically significant. A study in China explained this as being part of palliative care which is widely emerging nowadays, where they noted a percentage of 80% DNR within their terminally ill cancer patient sample.[3] This also suggests that the hospital to which a patient is admitted has an influence on whether a DNR is issued. Similarly, a study in Bellevue Hospital of New York City showed that

DNR patients were more than twice as likely to have a malignancy.[12]

Diagnostic category

In general, the diagnostic categories did not yield statistical significance in determining DNR issuance (chi = 6.955, p-value = 0.180). However, we noted discrepancy among the percentages of certain categories viz neurological and polytrauma.

One fifth (20.5%) of neurological patients in the surgical ICU and medical ICU received DNR status, and 42.9% of the patients who received DNR were neurological patients. In Taiwan, Chao et al., over a three-year period, reviewed the deaths of neurological patients and found that 87% of them had a DNR order.[13] The higher rates exhibited in the study by Chao et al. in comparison with the present study, could be attributed to the legal description of severe neurological diseases as terminal illnesses in Taiwan and are therefore eligible for hospice care.[12]

Among polytrauma patients in our sample, none had a DNR order. This can be hypothesized by severity of motor vehicle accidents where patients usually sustain fatal injuries and have a brief length of stay compared to other critical care patients. Unlikely, in a retrospective study at Miami Valley Hospital in Dayton, Ohio, medical records were reviewed for 263 trauma patients in 2014 with a DNR order and showed that DNR rates among trauma patients were 8%.[7] This included orders that were issued before and after hospitalization. Due to differences in DNR order guidelines between Saudi Arabia and the US and the hospital being a trauma center we cannot compare between the two results.

Conclusion and future directions

In this report we demonstrate most recent rates of DNR orders in a public teaching hospital in the Eastern Province of Saudi Arabia and highlight their determinants. We have found statistical significance in DNR rates among oncological patients, which can be attributed to advanced stages of disease and metastasis. Here, the DNR order rates and the related determinants were studied in a single-center public university-affiliated teaching hospital. Further, prospective multi-centered studies in teaching and non-teaching hospitals, public and private hospitals in different regions of Saudi Arabia need to be conducted to capture a more comprehensive view of DNR determinants and patients' characteristics in this country.

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Tables

Table 1: ICU patients' demographics and characteristics

Characteristics	**Frequency**
Gender	
Male	106 (48.4%)
Female	113 (51.5%)
Age Mean (SD)	59.82 (19.2)
Nationality	
Saudi	173 (79%)
Non-Saudi	46 (21%)
DNR status	
Yes	21 (9.6%)
No	198 (90.4%)
Cancer status	
Yes	17 (7.8%)
No	202 (92.2%)
ICU	
Medical ICU	116 (53%)
Surgical ICU	103 (47%)

Reason for admission	
Cardiovascular	18 (8.2%)
Gastrointestinal	31 (14.2%)
Neurological	45 (20.5%)
Others	78 (35.6%)
Polytrauma	10 (4.6%)
Respiratory	37 (16.9%)

Table 2: Correlation between the patients' DNR status and their characteristics

Characteristic	**DNR status**		**Chi square**	**P-value**
	Yes	**No**		
Gender				
Male	7 (6.6)	99 (93.4)	2.112	0.146
Female	14 (12.4)	99 (87.6)		
Nationality				
Saudi	18 (10.4)	155 (89.6)	0.632	0.578
Non-Saudi	3 (6.5)	43 (93.5)		
Cancer status				
Yes	6 (35.3)	11 (64.7)	14.047	0.002
No	15 (7.4)	187 (92.6)		
ICU				
Medical ICU	8 (6.9)	108 (93.1)	2.062	0.151
Surgical ICU	13 (12.6)	90 (87.4)		

Diagnostic category				
Cardiovascular	0 (0.0)	18 (100.0)	6.955	0.180
Gastrointestinal	3 (9.7)	28 (90.3)		
Neurological	9 (20.0)	36 (80.0)		
Others	6 (7.7)	72 (92.3)		
Polytrauma	0 (0.0)	10 (100.0)		
Respiratory	3 (8.1)	34 (91.9)		

What is already known on this topic?

Several studies have addressed the association of medical and demographic factors to DNR directives across the globe. However, there appear to be significant gaps in the related data analysis within Saudi Arabia, especially from the Eastern Province.

- **What this study adds?**

This report illustrates the most recent rates of DNR orders in a university-affiliated public teaching hospital in the Eastern Province of Saudi Arabia and highlights the related determinants. We have found statistical significance in DNR order rates among oncological patients, which can be attributed to advanced stages of disease and metastasis.

- **Suggestions for further development**

Prospective multi-centered studies in teaching and non-teaching hospitals, public and private hospitals in different regions of Saudi Arabia need to be conducted to capture a more comprehensive view of DNR order determinants and patients' characteristics in Saudi Arabia.