

ORIGINAL PAPER

End-of-life decisions in emergency patients: prevalence, outcome and physician effect

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Summary

Background: End-of-life decisions (EOLD) represent potentially highly consequential decisions often made in acute situations, such as ‘do not attempt resuscitation’ (DNAR) choices at emergency presentation.

Aim: We investigated DNAR decisions in an emergency department (ED) to assess prevalence, associated patient characteristics, potential medical and economic consequences and estimate contributions of patients and physicians to DNAR decisions.

Design: Single-centre retrospective observation, including ED patients with subsequent hospitalization between 2012 and 2016. Primary outcome was a DNAR decision and associated patient characteristics. Secondary outcomes were mortality, admission to intensive care unit and use of resources.

Methods: Associations between DNAR and patient characteristics were analysed using logistic mixed effects models, results were reported as odds ratios (OR). Median odds ratios (MOR) were used to estimate patient and physician contributions to variability in DNAR.

Results: Patients of 10 458 were attended by 315 physicians. DNAR was the choice in 23.3% of patients. Patients’ characteristics highly associated with DNAR were age (OR = 4.0, 95% CI = 3.6–4.3) and non-trauma presentation (OR = 2.3, 95% CI = 1.9–2.9). In-hospital mortality was significantly higher (OR = 5.4, CI = 4.0–7.3), and use of resources was significantly lower (OR = 0.7, CI = 0.6–0.8) in patients choosing DNAR. There was a significant effect on DNAR by both patient (MOR = 1.8) and physician (MOR = 2.0).

Conclusions: DNAR choices are common in emergency patients and closely associated with age and non-trauma presentation. Mortality was significantly higher, and use of resources significantly lower in DNAR patients. Evidence of a physician effect raises questions about the choice autonomy of emergency patients in the process of EOLD.

Introduction

End-of-life decisions (EOLD) regarding cardio-pulmonary resuscitation (CPR) and admission to intensive care unit (ICU) are potentially highly consequential decisions. At least in theory, they are personal choices in which, notwithstanding consultation with family and physicians, the individual exercises autonomy.

Unfortunately, advance care directives are yet uncommon.^{1–3} Therefore, patients are often asked to make EOLD at presentation to the emergency department (ED). Taking such a decision can be daunting, especially under time pressure, possible discomfort and pain. Such choices—even under better conditions—are anything but trivial, involving the prediction of

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future and highly uncertain states and trade-offs between potentially incommensurate values and concerns. It is therefore conceivable that emergency physicians may take on a significant role rivalling patients' autonomy. Furthermore, decisions such as 'do not attempt resuscitation' (DNAR) can have consequences the patient did not foresee or desire to choose concerning, for instance, mortality and resource allocation. According to the latest guidelines of the Swiss Academy of Medical Sciences, DNAR decisions in Switzerland should be based on three principles of medical ethics: the principles of beneficence and non-maleficence, and the duty to respect patient autonomy.⁴ Especially the principle of respecting patients' autonomous choices is highly relevant in daily clinical practice, and distinguishes Switzerland from other countries (e.g. Scandinavian countries). Legally, physicians are not allowed to over-rule patients' or their legal proxies' decisions apart from futility.

Although, there are recent studies on the impact of early DNAR decisions on patient outcomes,^{5,6} there is little research on the prevalence of DNAR decisions and their possible consequences. Even less is known to what extent ED patients' EOLD are associated with the attending physician (a potential physician effect). Previous studies have taken place in settings without acute complaints,⁷ focusing on patient characteristics, such as age and gender, but without the consideration of potential confounds.⁸ We therefore conducted a hypothesis-generating retrospective study on EOLD in patients presenting to the ED. Our first aim was to estimate the prevalence of DNAR decisions. Second, we aimed to identify patient characteristics being associated with DNAR decisions. Third, we examined associations between DNAR decisions and outcome measures and resource consumption. Fourth, we assessed the extent to which physicians have an effect on patients' EOLD.

Materials and methods

Setting and participants

This is a retrospective analysis of patients admitted through the ED of the University Hospital Basel (UHBS), Switzerland, between 2012 and 2016. We thus take advantage of the fact that the Swiss DRG was introduced nationwide only in January 2012, guaranteeing standardized coding of patients' ICD codes. Patients with ED electronic health records (EHR) and without changes in their history and/or changes in their EOLD after transfer to other departments were eligible. The population selected permitted the investigation of early EOLD decisions, avoiding potential confounders. Patients who declined to give a general research consent to the UHBS, younger than 18 years, immediately admitted to hospital (i.e. direct boarding), without an electronic documentation of EOLD, or with missing data (Figure 1) were not included. The local ethics committee approved the study (EKNZ 2015-312).

Definitions and measurements

Physicians recorded patients' EOLD in the EHR before admission to the hospital: the decision for or against (a) CPR and (b) admission to ICU. Decisions were categorized into three distinct preferences: (1) Full life support; (2) DNAR, ICU yes; and (3) DNAR, ICU no. DNAR and ICU admission are not mutually exclusive in our setting. Since patient characteristics were similar in Groups 2 and 3 (Supplementary Appendix S1), patients of these groups were merged into one group: DNAR.

The following patient characteristics were analysed: Emergency Severity Index (ESI), number of previous hospitalizations, number of diagnoses and presentation as trauma or non-trauma patient. The ESI is a five-level triage tool, stratifying patients into least (5) to most (1) urgent, based on patient acuity and use of resources.⁹ All patient information were extracted from the hospital's EHR by a trained and independent IT expert who was blind to the study objectives. All diagnoses were coded by professional and certified coders of the UHBS using the definitions of ICD.¹⁰ Two independent raters checked 100 random cases; both, rater agreement and data accuracy were 100.0%.

Outcomes, such as admission to ICU, in-hospital mortality and use of resources were extracted from the hospital's database. In-hospital mortality was considered up to 6 months after presentation, because our focus was not only in the critical period of the hospitalization but also longer-term. Use of resources was defined as the reimbursement (converted to US dollars) for diagnosis related groups (Swiss DRG), used by Swiss insurance companies. Swiss DRG corrects for real costs as defined by previous use of resources in each DRG by a reference group of Swiss hospitals.¹¹ Use of resources was transformed into a dichotomous variable by setting a cut-off at the median (low resource use vs. high resource use).

Statistical analysis

All statistical analyses were performed using the software program R (Version 3.4.1). With the R package lme4, a logistic mixed effects model was computed to investigate the influence of independent variables (age, gender, ESI score, trauma/non-trauma presentation, number of previous hospitalizations, number of diagnoses, diagnosis of depression and diagnosis of dementia) on patients' EOLD, our dependent variable. A mixed effects model was chosen to control for random effects, such as patient and physician effects. Specifically, the model was able to control for patients admitted more than once and for physicians attending several patients during the study period. In order to take variability of physicians into account, random effect sizes were then converted into a median odds ratio (MOR), quantifying cluster heterogeneity, allowing us to directly compare between covariate effects and their magnitude (i.e. patient vs. physician effect).¹² MOR was taken as measure for the extent to which the patient and the physician have an influence on the recorded EOLD. Odds ratios (OR) and confidence intervals were estimated for the dependent variables.

Furthermore, logistic mixed effects models were used as measures of patients' EOLD on their individual outcomes regarding admission to ICU, in-hospital mortality and use of resources. Controlling for patients and physicians, these models included patients' age, gender, ESI score, trauma/non-trauma presentation, number of previous hospitalizations, number of diagnoses, diagnosis of depression and diagnosis of dementia as dependent variables in order to control for patients' characteristics. A level of $P < 0.05$ was considered statistically significant.

Results

In total, 10 458 ED patients, attended by 315 physicians, with subsequent hospitalization were analysed (Figure 1). As shown in Table 1, mean age of patients was 65.5 years (SD = 21.4 years) with a range from 18 to 110 years, and 5712 (54.6%) were women. In line with the decision to admit the patient to the hospital, the vast majority of patients (94.2%) was triaged with an ESI score of

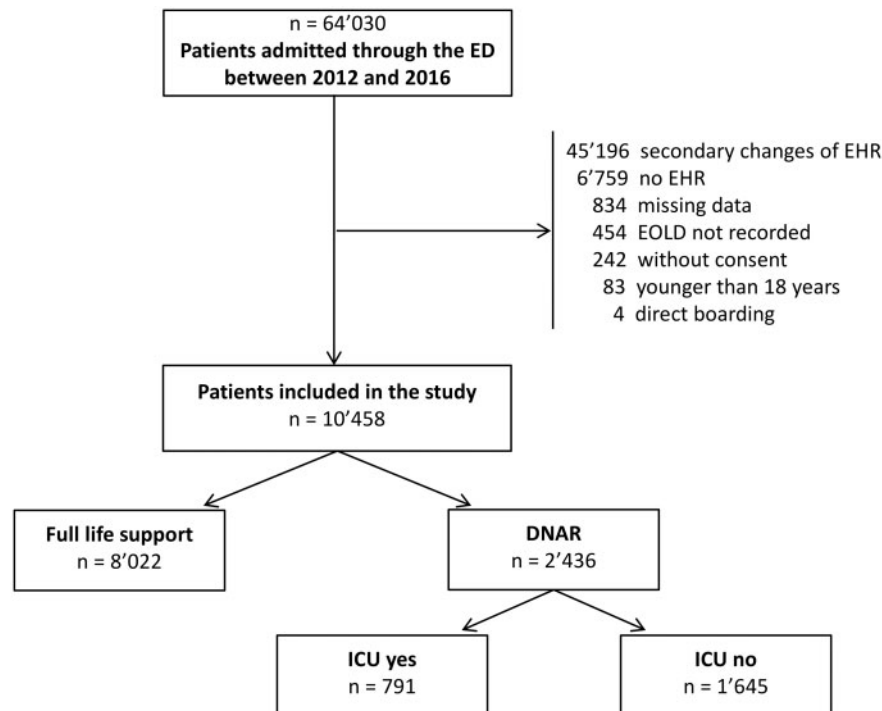


Figure 1. Flow chart of inclusion and primary outcome.

Table 1. Patient characteristics

	Overall n = 10 458	Full life support n = 8022	DNAR n = 2436
Age, years, mean (SD)	65.5 (21.4)	59.7 (20.8)	84.7 (8.3)
Female gender, % (n)	54.6 (5712)	51.9 (4164)	63.5 (1548)
Triage, % (n)			
ESI 1-3	94.2 (9847)	93.3 (7482)	97.1 (2365)
ESI 4-5	5.8 (611)	6.7 (540)	2.9 (71)
Non-trauma patient	72.1 (7536)	68.5 (5495)	83.8 (2041)
Trauma patient	27.9 (2922)	31.5 (2527)	16.2 (395)
Previous hospitalizations, mean (SD)	2.9 (4.3)	2.6 (4.1)	4.2 (4.6)
Number of diagnoses, mean (SD)	5.2 (2.5)	4.9 (2.4)	6.4 (2.5)
Psychiatric comorbidity, % (n)			
Depression	10.5 (1099)	10.6 (854)	10.1 (245)
Dementia	12.7 (1327)	12.9 (1033)	12.1 (294)
Outcomes			
Admission to ICU, % (n)	0.5 (55)	0.7 (52)	0.1 (3)
Death within half a year, % (n)	3.1 (329)	1.1 (90)	9.8 (239)
Use of resources, \$, median (IQR)	2595 (1294)	2623 (1340)	2494 (1204)

1–3. About 2922 (27.9%) were trauma patients. The mean number of previous hospitalizations at the UHBS was 2.9 (SD = 4.3), and the mean number of diagnoses retrieved from the EHR was 5.2 (SD = 2.5). Depression and dementia were diagnosed in 10.5% and 12.7% of all patients, respectively. Admission to ICU was 0.5%, and in-hospital mortality was 3.1%. 72.6% of the deceased patients had a DNAR decision. The calculated median use of resources was \$2595.

The prevalence of patients' EOLD preferences was as follows: 8022 (76.7%) of all patients chose full life support, 2436 (23.3%) declined full life support (i.e. DNAR), of which 791 (7.6%) chose DNAR but admission to ICU and 1645 (15.7%) chose DNAR and no ICU in case of need (Supplementary Appendix S1).

Computing a likelihood ratio test showed that there were significant differences between the models with and without the random factors patient ($P < 0.001$) and physician ($P < 0.001$). Patients had a MOR of 1.8, while physicians had a MOR of 2.0. As patients and physicians had a significant effect on patients' EOLD, all calculations were controlled for patients and physicians.

A logistic mixed effects model showed a significant association between the following patient characteristics and the DNAR decision: age, non-trauma presentation, number of previous hospitalizations and number of diagnoses ($P < 0.001$; Table 2). The strongest associations were found in older age (OR = 4.0, CI = 3.6–4.3) and non-trauma presentation (OR = 2.3, CI = 1.9–2.9). Gender, ESI, depression and dementia were not significantly associated with DNAR when controlling for patient characteristics (Table 2). Although significant associations with DNAR ($P < 0.001$) were found in univariate analyses for female gender (OR = 1.5, CI = 1.4–1.8), and a lower ESI score (OR = 2.4, CI = 1.9–3.1), they vanished when controlling for patient characteristics. According to the results of a logistic mixed-effects model, patients with DNAR decisions were more likely to die in hospital (OR = 5.4, 95% CI = 4.0–7.3) and were associated with the allocation of less resources according to the Swiss DRG (OR = 0.7, 95% CI = 0.6–0.8; Table 3).

Discussion

The main results of this analysis of EOLD in emergency patients were the relatively high prevalence of DNAR decisions and the higher 6-months-mortality associated with it. DNAR was associated

with older age and non-trauma presentation. The treating ED physicians had an effect on patients' DNAR decisions.

The prevalence of 23.3% DNAR decisions in our cohort needs to be put into perspective. A recent study on EOLD in patients admitted through the ED reported a prevalence of 13%, with a tendency to increase over the observed period.⁸ However, only patients over 65 years were included in that study, and the primary outcome was a DNAR order placed within the first 24 h of admission. Therefore, it is not known if patients' age or the potentially later decision made the difference in the EOLD. The UHBS requires the recording of EOLD before admission to an in-hospital ward. This may have increased the pressure put on patients, proxies and caregivers to make an EOLD already in the ED. The importance of EOLD was shown in a study of European ICUs. The authors reported limited life-sustaining therapy before death in 73% of all patients¹³; which is comparable to the percentage of DNAR decisions in our deceased population.

Second, patient characteristics associated with DNAR were older age and non-trauma presentation. Many studies have emphasized the importance of age on EOLD,¹⁴ possibly due to the belief of having lived a full life or reasoning about the inevitable end of life.¹⁵ In contrast to our data, the influence of age was only controlled for few or no additional patient characteristics in other studies.^{7,8,15-17} Trauma patients were less likely to choose DNAR in comparison to non-trauma patients in our

study, which is a novel finding in emergency medicine. The only report on the influence of DNAR orders on mortality in trauma showed that DNAR orders were the major predictor of mortality, almost eliminating the effect of age.¹⁸ A reason for the 2-fold higher likelihood to choose full life support in trauma could be the higher prevalence of trauma in healthy and younger populations, but our analysis shows an effect independent of age, gender and comorbidity. Some studies found no effect for higher comorbidity on DNAR orders,^{19,20} while others showed an effect of multi-morbidity on EOLD.^{21,22} Other factors need to be taken into account, such as increased time-pressure or physician effects. The influence of physicians represents indeed the most striking result in our analysis, raising questions on effects of age, gender, specialty and experience of physicians as well as exposition to traumatic events.²³ Attitude and religion are other possible characteristics, one study showing significant associations between physicians' religion and EOLD.¹³

Third, the proportion of more than 30% of DNAR patients opting for conceivable ICU admission might appear high from the emergency medicine perspective. However, in certain patient groups, such as in cancer patients, many are admitted to ICU for vasopressor and non-invasive ventilator support.²⁴ Furthermore, a recent report on emergency patients choosing DNAR showed that 86% and 64% believe that DNAR orders should not be applied in case of allergic reaction or cardiac arrest, respectively.¹ Although EOLD might be cognitively taxing, these findings indicate that differential choices are feasible. There seems to be great variability in patient perspectives—some even puzzling caregivers—underscoring the importance of training in communication regarding EOLD.

Fourth, in-hospital mortality differed 9-fold between patients with full life support and patients with DNAR decision. The lower survival of patients with DNAR orders was also found in previous studies investigating survival to discharge.²⁵ The current results show that patients close to death chose DNAR in over 70%.

Finally, the choice of reduced life support was significantly associated with use of fewer resources (median difference of approximately 5%). This is an intriguing finding, as patients choosing to forgo intensive care and/or DNAR may not generally wish to receive less or no treatment. Further studies should therefore focus on the physicians' decision-making process, training of ethical competences and communication skills. EOLD may be described in more detail in order to allow patients

Table 2. Patient characteristics associated with primary outcome (DNAR)

	Adjusted odds ratio	P-value
Age (per decade)	4.0 [3.6–4.3]	<0.001*
Gender (women vs. men)	1.1 [1.0–1.3]	0.06
Triage level (1–3 vs. 4 and 5)	1.3 [0.9–1.9]	0.14
Non-trauma (vs. trauma)	2.3 [1.9–2.9]	<0.001*
Previous hospitalizations ^a	1.1 [1.1–1.1]	<0.001*
Number of diagnoses ^a	1.1 [1.1–1.1]	<0.001*
Depression	1.1 [0.9–1.4]	0.48
Dementia	1.0 [0.8–1.2]	0.97

^aPer one unit increase.

*Significant with $P < 0.01$.

Results are expressed as odds ratios with 95% confidence intervals. The statistical analysis was computed with a mixed-effects model controlling for physician and patient effects.

Table 3. Predictors of outcomes

	ICU admission		In-hospital mortality		Use of resources	
	Adjusted odds ratio	P-value	Adjusted odds ratio	P-value	Adjusted odds ratio	P-value
DNAR	0.3 [0.1–1.1]	0.08	5.4 [4.0–7.3]	<0.001*	0.7 [0.6–0.8]	<0.001*
Age (per decade)	1.0 [0.8–1.1]	0.70	1.2 [1.1–1.4]	<0.001*	1.0 [1.0–1.0]	0.38
Gender (women vs. men)	0.4 [0.3–0.8]	<0.01*	0.6 [0.4–0.7]	<0.001*	0.9 [0.8–1.0]	<0.01*
Triage level (1–3 vs. 4 and 5)	1.2 [0.4–3.5]	0.72	1.5 [0.7–3.2]	0.30	1.6 [1.4–1.9]	<0.001*
Non-trauma (vs. trauma)	0.7 [0.4–1.4]	0.34	1.2 [0.9–1.7]	0.23	0.8 [0.7–0.9]	<0.001*
Previous hospitalizations ^a	0.9 [0.8–1.0]	0.10	1.1 [1.0–1.1]	<0.001*	1.0 [0.9–1.0]	<0.001*
Number of diagnoses ^a	1.0 [0.8–1.1]	0.49	1.1 [1.1–1.2]	<0.001*	1.2 [1.1–1.2]	<0.001*
Depression	1.4 [0.5–3.4]	0.52	1.2 [0.8–1.8]	0.49	1.1 [1.0–1.3]	0.10
Dementia	0.6 [0.2–1.7]	0.36	1.0 [0.6–1.4]	0.80	1.0 [0.9–1.1]	0.95

^aPer one unit increase.

*Significant with $P < 0.01$.

Results are expressed as odds ratios with 95% confidence intervals. The statistical analyses were computed with a mixed-effects model controlling for physician and patient effects. In-hospital mortality was defined as death within the first six months after ED presentation. In order to be able to compute OR for use of resources, we made a median split at \$2595.

differential, and preferably autonomous choices without the danger of undesired withholding of resources.

Limitations

The main limitations are the study's single centre approach and its retrospective nature, the latter permitting for merely limited in-depth analysis of the decision process of both patients and physicians. However, in the hospital studied, physicians are strongly advised to explain advantages and disadvantages of CPR and ICU, and Swiss law does not allow physicians, but only patients or proxies, to make such decisions except in case of futility. Furthermore, our data do not shed light on the underlying reasons to forgo life-prolonging interventions. We also did not analyse the influence of advance directives. Since we excluded all patients with secondary changes to their EHR, an inclusion bias in favour of a healthier population is very likely: Patients excluded from analysis due to secondary file openings had a mean age of 64.4 years ($SD = 19.0$), with a mean number of previous hospitalizations of 6.5 ($SD = 4.8$) and a mean number of diagnoses of 10.5 ($SD = 4.8$). It is even more striking that, despite a likely inclusion bias, we have observed effects on patient outcomes, such as use of fewer resources and higher mortality after DNAR decisions. Therefore, if anything, our results may underestimate the effect of a DNAR decision on patients' outcomes.

Conclusions

We show a high prevalence of DNAR decisions; associated with a higher mortality in patients admitted through an ED. Patient characteristics such as age and non-trauma presentation were associated with DNAR decisions. Intriguingly, we found a physician effect on patients' EOLD. This finding deserves further investigation, as it raises the issue of patient autonomy and its limits to it when making end of life decisions.

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Ethics approval

The local ethics committee approved the study (EKNZ 2015-312).

Disclaimer

The authors confirm that the views expressed in the submitted article are our own and not an official position of an institution or funding agency.

Supplementary material

Supplementary material is available at *QJMED* online.

Conflict of interest: None declared.

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