

Characteristics associated with decision-making regarding withholding or withdrawing life-sustaining treatments: a 5-year retrospective analysis at an intensive care unit in a tertiary hospital in southern China

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Abstract

Background: The decision to withhold or withdraw life-sustaining treatments is a pivotal facet of end-of-life care for patients. Previous research has revealed substantial global disparities in this issue, with limited investigations conducted in China.

Methods: A retrospective study investigating the prevalence of withholding or withdrawing life-sustaining treatments at an intensive care unit in a tertiary hospital from January 2013 to May 2018 was conducted to elucidate the associated characteristics. The primary outcome measure was the prevalence of withholding or withdrawing life-sustaining treatments. The secondary measures were the demographic and clinical data. Univariate and multivariate logistic regression analyses were performed to determine associations between the clinical characteristics and the decision-making.

Results: This analysis included 437 patients, of which 372 (85.1%) experienced withholding or withdrawal of life-sustaining treatments. Older age (odds ratio [OR]: 1.03; 95% confidence interval [CI]: 1.01–1.05), rural residence (OR: 2.92; 95% CI: 1.17–7.32), belonging to the local province (OR: 1.38; 95% CI: 1.22–1.57), lower per capita income group (OR: 3.59; 95% CI: 2.52–5.09), and a primary diagnosis of trauma (OR: 4.95; 95% CI: 1.19–20.64), neurosurgical disorder (OR: 4.42; 95% CI: 1.76–11.06), or neurological disorder (OR: 12.33; 95% CI: 1.56–97.52) were significantly associated with the decision to withhold or withdraw life-sustaining treatments.

Conclusion: Withholding or withdrawing life-sustaining treatments may vary based on factors such as age, residential location, per capita income, and the primary diagnosis. It is imperative that healthcare policymakers acknowledge these variations and consider the local ethical norms and cultural practices when facing this issue.

Keywords: Critical care, End-of-life care, Ethics, Withdrawing, Withholding

Introduction

The field of critical care medicine has made remarkable progress in the management of patients with advanced illnesses; however, it presents physicians with a challenging dilemma of balancing life-saving interventions and ensuring optimal comfort for their patients.^[1,2] Implementing end-of-life decision-making aims to enhance the patients' autonomy and improve their quality of life during their final stages.^[3,4] The with-

holding or withdrawal of life-sustaining treatments (LSTs) constitutes a crucial aspect of end-of-life decision-making. Making appropriate decisions regarding the withholding or withdrawal of LST not only alleviates futile therapy-induced discomfort for the patient but also optimizes the utilization of medical resources.^[5,6] However, significant disparities exist worldwide in the withholding or withdrawal of LST.^[7,8] Diverse cultural backgrounds, religious beliefs, socioeconomic statuses, ethical considerations, and legal systems may lead to varying approaches in the withholding or withdrawal of LST across different countries.^[9–11]

Compared with Western countries, China lags in the development of decision-making practices for withholding or withdrawing LST. Additionally, there is a lack of consensus in China regarding recommendations to guide life support care for critically ill patients. Only a few studies on withholding or withdrawing LST have been published involving Chinese patients.^[12–15] The results of these studies exhibited significant variation, warranting further investigations of the characteristics associated with withholding or withdrawing LST in China.

We conducted this retrospective review to investigate the prevalence of withholding or withdrawing LST in our hospital's intensive care unit (ICU). Additionally, we aimed to elucidate the characteristics associated with decision-making regarding withholding or withdrawing LST.

Methods

Study design and participants

A single-center, retrospective observational cohort study was conducted in the ICU of our tertiary hospital in Hainan, the

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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southernmost province of China, from January 2013 to May 2018. The study protocol was approved by the Ethics Committee of Hainan Hospital of Chinese PLA General Hospital. The study included individuals aged ≥ 18 years who had died during their stay or within 2 days of discharge. The patient's legal representatives voluntarily signed the informed consent form about withholding or withdrawing life-sustaining treatments after fully understanding consent. Patients with incomplete data were excluded.

Data collection and outcome measurements

We reviewed the medical charts of the patients to record their decision to withhold or withdraw LST as the primary measure. The secondary measures were baseline information, such as age, sex, residence location (belonging to local or other provinces; residence in rural or urban areas), per capita income group, primary diagnosis, comorbidities, and duration of ICU stay. Per capita income for this study was grouped according to the data published by the National Bureau of Statistics from 2013 to 2018 (<https://data.stats.gov.cn/easyquery.htm?cn=C01>). The national residents are categorized into 5 income groups based on their per capita income level, ranging from low to high. These groups include the low-income group (comprising the lowest 20% of households by income), lower-middle-income group, middle-income group, upper-middle-income group, and high-income group. On admission, disease severity was assessed using the Acute Physiology and Chronic Health Evaluation II and Sequential Organ Failure Assessment scoring systems,^[16,17] and comorbidity using the Charlson Comorbidity Index.^[18]

Patients were allocated to either the withholding or withdrawing LST group or the full life support (FLS) group based on their decision following discussions between the primary treating physicians and the patients and/or their healthcare proxies.^[7,8,10] Withholding treatments comprised the refusal of new interventions, such as endotracheal intubation and mechanical ventilation (MV), cardiovascular resuscitation, therapeutic escalation, or other invasive procedures. Withdrawing treatments included the discontinuation of ongoing therapies, including MV, continuous renal replacement therapy, and intravenous infusion. Declining all active interventions and being discharged home was considered under the category of withdrawing treatments.

Statistical analysis

Continuous data are presented as mean \pm standard deviation or as medians with percentiles and compared using the Student *t* test or the Mann-Whitney *U* test, respectively. Categorical data are presented as percentages and analyzed using the chi-square test or Fisher exact test. Univariate and multivariate logistic regression analyses were conducted to examine the associations between clinical characteristics and decision-making regarding the withholding or withdrawal of LST. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0 (IBM Corp, Armonk, NY, USA). $P < 0.05$ were considered statistically significant.

Results

This study enrolled 437 patients, with 372 (85.1%) experienced withholding or withdrawal of LST. To minimize selection bias, all cases fulfilling the inclusion criteria were included in the study. Among the 13 patients excluded due to missing information, 9 cases belonged to the withholding or withdrawing LST group and 4 to the FLS group. Patients in the withholding or withdrawing LST group were more likely to have a primary diagnosis of neurological disorder (12.4% vs. 1.5%), neurosurgical disorder (32.5% vs. 13.8%), or trauma (10.2% vs. 4.6%) compared to those in the FLS group.

Table 1

Characteristics of Patients Admitted to the Intensive Care Unit With Either Full Support Care or Withholding/Withdrawing of Life-Sustaining Treatment

| Characteristics | Full Life Support (n = 65) | Withholding/Withdrawing (n = 372) | P |
|-------------------------------------|----------------------------|-----------------------------------|---------|
| Gender, n (%) | | | |
| Male | 49 (75.4%) | 272 (73.1%) | 0.703† |
| Age, median (IR) | 62 (23) | 63 (25) | 0.971§ |
| APACHE II, median (IR) | 19 (10) | 21 (10) | 0.189§ |
| SOFA, median (IR) | 9 (4) | 9 (3) | 0.687§ |
| Provinces, n (%)* | | | <0.001† |
| Local | 5 (7.7%) | 188 (50.5%) | |
| Others | 60 (92.3%) | 184 (49.5%) | |
| Rural, n (%)* | 7 (10.8%) | 136 (36.6%) | <0.001† |
| Per capita income group, n (%)* | | | <0.001† |
| 1 | 19 (29.2%) | 14 (3.8%) | |
| 2 | 18 (27.7%) | 26 (7.0%) | |
| 3 | 25 (38.5%) | 76 (20.4%) | |
| 4 | 2 (3.1%) | 119 (32.0%) | |
| 5 | 1 (1.5%) | 137 (36.8%) | |
| Primary diagnosis, n (%)* | | | <0.001† |
| Respiratory | 18 (27.7%) | 70 (18.8%) | |
| Trauma | 3 (4.6%) | 38 (10.2%) | |
| Neurosurgery | 9 (13.8%) | 121 (32.5%) | |
| Neurology | 1 (1.5%) | 46 (12.4%) | |
| Surgery | 8 (12.3%) | 20 (5.4%) | |
| Digestive | 5 (7.7%) | 25 (6.7%) | |
| Cardiovascular | 21 (32.3%) | 52 (14.0%) | |
| Sepsis, n (%) | 10 (15.4%) | 36 (9.7%) | 0.167† |
| CCI, median (IR) | 1 (3) | 1 (2) | 0.323§ |
| ICU length of stay, days, mean (SD) | 13.9 (17.7) | 12.5 (14.0) | 0.017‡ |

* $P < 0.01$.

†Chi-square test.

‡Student *t* test.

§Mann-Whitney *U* test.

APACHE II, Acute Physiology and Chronic Health Evaluation; CCI, Charlson's Weighted Index of Comorbidities; ICU, intensive care unit; IR, interquartile range; SD, standard deviation; SOFA, Sequential Organ Failure Assessment.

Additionally, the proportion of patients belonging to the local province (50.5% vs. 7.7%) and residing in rural areas (36.6% vs. 10.8%) was higher in the withholding or withdrawing LST group than in the FLS group (Table 1). The univariate analysis revealed significant associations between withholding and withdrawing LST and factors such as age (odds ratio [OR]: 1.04; 95% confidence interval [CI]: 1.01–1.06; $P = 0.019$), rural residence (OR: 3.71; 95% CI: 1.41–9.79; $P = 0.012$), belonging to the local province (OR: 20.33; 95% CI: 6.25–66.11; $P < 0.001$), lower per capita income (OR: 3.41; 95% CI: 2.57–4.52; $P = 0.002$), and having a diagnosis of trauma (OR: 7.55; 95% CI: 1.52–37.47; $P = 0.012$), neurological disorder (OR: 19.45; 95% CI: 2.35–160.85; $P = 0.013$), or neurosurgical disorder (OR: 7.08; 95% CI: 2.40–20.91; $P = 0.002$) (Table 2).

The multivariate logistic regression analysis revealed that older age (OR: 1.03; 95% CI: 1.01–1.05; $P < 0.001$), rural residence (OR: 2.92; 95% CI: 1.17–7.32; $P < 0.024$), belonging to the local province (OR: 1.38; 95% CI: 1.22–1.57; $P < 0.001$), lower per capita income (OR: 3.59; 95% CI: 2.52–5.09; $P = 0.024$), and a primary diagnosis of trauma (OR: 4.95; 95% CI: 1.19–20.64; $P = 0.036$), neurological disorder (OR: 12.33; 95% CI: 1.56–97.52; $P = 0.024$), or neurosurgical disorder (OR: 4.42; 95% CI: 1.76–11.06; $P = 0.002$) were significantly associated with withholding or withdrawing LST (Table 2).

Specifically, LST was withdrawn in 269 patients and withheld in 62 patients. Additionally, LST was withdrawn in another 41

Table 2
Univariate and Multivariate Logistic Regression Analysis of Characteristics Associated With Withdrawing/Withholding Decisions

| Characteristics | Univariate Analyses | | | Multivariate Analyses | | |
|--------------------------|---------------------|-------|-------------|-----------------------|-------|------------|
| | P | OR | 95% CI | P | OR | 95% CI |
| Age | 0.019 | 1.04 | 1.01–1.06 | <0.001 | 1.03 | 1.01–1.05 |
| CCI | 0.251 | 1.13 | 0.92–1.40 | | | |
| APACHE II | 0.752 | 0.99 | 0.94–1.04 | | | |
| Rural resident | 0.012 | 3.71 | 1.41–9.79 | 0.024 | 2.92 | 1.17–7.32 |
| Local province | <0.001 | 20.33 | 6.25–66.11 | <0.001 | 1.38 | 1.22–1.57 |
| Primary diagnosis | | | | | | |
| Respiratory | 0.134 | 1.90 | 0.83–4.34 | | | |
| Trauma | 0.012 | 7.55 | 1.52–37.47 | 0.036 | 4.95 | 1.19–20.64 |
| Neurosurgery | 0.002 | 7.08 | 2.40–20.91 | 0.002 | 4.42 | 1.76–11.06 |
| Neurology | 0.013 | 19.45 | 2.35–160.85 | 0.024 | 12.33 | 1.56–97.52 |
| Surgery | 0.304 | 0.52 | 0.15–1.82 | | | |
| Digestive | 0.616 | 1.38 | 0.40–4.69 | | | |
| Cardiovascular | 0.003 | 0.34 | 0.19–0.62 | | | |
| Per capita income group | 0.002 | 3.41 | 2.57–4.52 | <0.001 | 3.59 | 2.52–5.09 |
| ICU length of stay, days | 0.471 | 0.994 | 0.98–1.01 | | | |

APACHE II, Acute Physiology and Chronic Health Evaluation; CCI, Charlson’s Weighted Index of Comorbidities; CI, confidence interval; ICU, intensive care unit; OR, odds ratio; SOFA, Sequential Organ Failure Assessment.

patients with a previous decision to withhold it. Cardiopulmonary resuscitation was the most withheld single treatment. “Declining all active treatment and being discharged home” was the most frequent scenario among those who had their treatment withdrawn.

We further compared patients from the local province and other provinces. There were 193 patients from the local province and 244 from other provinces (Table 3). The mean age of the patients from the local province was higher than that of the patients from other provinces (69 ± 20 years vs. 57 ± 26 years; $P < 0.001$). Moreover, patients from other provinces exhibited a higher prevalence of respiratory or cardiovascular disorders ($P < 0.001$) and a greater likelihood of prolonged ICU stays compared to those from the local province (14.4 days vs. 10.5 days; $P = 0.015$). Conversely, patients from the local province more frequently resided in rural areas compared to those from other provinces ($P < 0.001$) (Table 3). The decision-making rate of withholding or withdrawing LST was higher among patients from the local province than among those from other provinces (96.9% vs. 75.4%; $P < 0.001$) (Table 4).

Discussion

Our retrospective study analyzed the data from an ICU in a local tertiary hospital to identify the characteristics associated with withholding or withdrawing LST. In this study, 85.1% of the patients (327 out of 437 ICU nonsurvivors) made end-of-life decisions known as withholding or withdrawing LST. This finding deviates from the results reported in a previous multinational observational study.^[7] Our study also revealed substantial global disparities in withholding or withdrawing LST.^[7,19–22] The highest rate of withholding or withdrawing of LST was observed in North America (75.8%), whereas the lowest rate was recorded in South Asia (11.3%) among nonsurvivors in the ICU.^[7] In East and Southeast Asia, which includes China, the rate of withholding or withdrawing LST among ICU nonsurvivors was 55.9%.^[7] A large prospective observational study^[23] reported that withholding treatment (44.1%) was more common than withdrawing treatment (36.4%), which differed from our result. Despite our hospital being in the southernmost part of China, our study reported a withholding or withdrawing LST decision rate of 85.1% among ICU nonsurvivors. This implies that even within a single region, there can be significant variations in the practice and acceptance of withholding or withdrawing LST. Physicians

should consider local factors when discussing withholding or withdrawing decisions with patients or their healthcare proxies. Policymakers should also consider local factors when making recommendations on this issue, particularly where clear ethical differences exist between China and Western countries.^[24]

Table 3
Characteristics of Patients Admitted to the Intensive Care Unit From Local or Other Provinces

| Characteristics | Local Province (N = 193) | Other Provinces (N = 244) | P |
|--------------------------------------|--------------------------|---------------------------|---------|
| Male, n (%) | 144 (75%) | 177 (73%) | 0.626† |
| Age, year, median (IR)* | 69 (20) | 57 (26) | <0.001§ |
| APACHE II, median (IR) | 21 (11) | 20 (10) | 0.442§ |
| SOFA, median (IR) | 9 (3) | 9 (4) | 0.256§ |
| Per capita income group, n (%)* | | | <0.001† |
| 1 | 8 (4.1%) | 25 (10.2%) | |
| 2 | 10 (5.2%) | 34 (13.9%) | |
| 3 | 36(18.7%) | 65 (26.6%) | |
| 4 | 90 (46.6%) | 31 (12.7%) | |
| 5 | 49 (25.4%) | 89 (36.5%) | |
| Primary diagnosis, n (%)* | | | <0.001† |
| Respiratory | 17 (9%) | 71 (29%) | |
| Trauma | 22 (11%) | 19 (8%) | |
| Neurosurgery | 71 (37%) | 59 (24%) | |
| Neurology | 25 (13%) | 22 (9%) | |
| Surgery | 17 (9%) | 11 (5%) | |
| Digestive | 17 (9%) | 13 (5%) | |
| Cardiovascular | 24 (12%) | 49 (20%) | |
| Severe sepsis | 19 (10%) | 27 (11%) | |
| CCI, median (IR)* | 1 (2) | 0 (1) | <0.001§ |
| Rural, n (%)* | 100 (52%) | 43 (18%) | <0.001† |
| ICU length of stay, days, mean (SD)* | 10.5 (13.6) | 14.4 (15.2) | 0.015‡ |

* $P < 0.05$.

†Chi-square test.

‡Student *t* test.

§Mann-Whitney *U* test.

APACHE II, Acute Physiology and Chronic Health Evaluation; CCI, Charlson’s Weighted Index of Comorbidities; ICU, intensive care unit; IR, interquartile range; SD, standard deviation; SOFA, Sequential Organ Failure Assessment.

Table 4
Withdrawing and Withholding Decisions in Patients from Local or Other Provinces

| Characteristics | Local Province (N = 193) | Other Provinces (N = 244) | P |
|---------------------------------------|--------------------------|---------------------------|---------|
| Full support, n (%) | 5 (2.6%) | 60 (24.6%) | <0.001* |
| Only withholding, n (%) | 4 (2.1%) | 58 (23.8%) | <0.001* |
| Only withdrawing, n (%) | 173 (89.6%) | 96 (39.3%) | <0.001* |
| Withholding and withdrawing, n (%) | 11 (5.7%) | 30 (12.3%) | 0.019* |
| Withholding | | | 0.012† |
| Cardiopulmonary resuscitation, n (%) | 4 (22.2%) | 76 (65.5%) | |
| Endotracheal intubation, n (%) | 4 (22.2%) | 10 (8.6%) | |
| CRRT, n (%) | 4 (22.2%) | 9 (7.8%) | |
| No therapeutic escalation, n (%) | 3 (16.7%) | 11 (9.5%) | |
| Other invasive treatments, n (%) | 3 (16.7%) | 10 (8.6%) | |
| Withdrawing | | | <0.001† |
| All treatments and examination, n (%) | 182 (98.9%) | 116 (88.5%) | |
| Venous infusion, n (%) | - | 8 (6.1%) | |
| Mechanical ventilation, n (%) | - | 4 (3.1%) | |
| CRRT, n (%) | 1 (0.5%) | 2 (1.5%) | |
| ECMO, n (%) | 1 (0.5%) | 1 (0.8%) | |

*Chi-square test.

†Fisher exact test.

CRRT, continue renal replacement therapy; ECMO, extracorporeal membrane oxygenation.

Only a few studies have investigated withholding or withdrawing LST in China.^[25] A previous study reported that the rate in Guangdong was 25.5%.^[15] This study reported a rate of 85.1%, which was comparatively higher than that reported in previous studies,^[15,26] and this could be attributed to cultural differences in attitudes toward death between our local province and other provinces. In the culture and tradition of the local people, especially in rural areas, it is deemed inappropriate for a patient to pass away outside their home, which could explain the decision of these nonsurvivors to discontinue active treatment and return home. China's vast size and diverse population encompass multiple ethnicities with distinct customs and cultural backgrounds across different regions of the country. This underscores the importance for physicians and policymakers to consider local factors when deliberating and formulating decisions regarding withholding or withdrawing LST in a multiethnic country like China.^[26]

The complexity of medical decision-making poses more challenges for rural residents when they are choosing treatment options. In mainland China, rural residents typically have lower incomes and less comprehensive medical insurance compared to their urban counterparts. Moreover, the likelihood of making decisions to withhold or withdraw LST was greater among families with a lower per capita income than in those with a higher per capita income. Some conditions (neurology, neurosurgery, and trauma) exhibited a significant correlation with the decision to withhold or withdraw LST in this study. It has been reported that financial considerations may be a prominent influencing factor affecting decisions regarding withholding or withdrawing LST.^[14] We also compared the rate of withholding or withdrawing of LST decisions between patients from the local province and other provinces. Our findings revealed a significantly higher rate among patients from the local province than among those from other provinces (96.9% vs. 75.4%). The impact of future economic factors on the decision to withhold or withdraw life-sustaining treatments can be further analyzed in conjunction with healthcare security policies.

This study showed that age, rather than the severity score of diseases and commodities at admission, was an independent factor associated

with decisions regarding withholding or withdrawing LST. This finding contradicts the findings of a multicenter study conducted in 2017 that demonstrated that patients deciding to withhold or withdraw LST were not older than those receiving FLS care. In a cohort study of 118,199 patients in the United Kingdom, older age, preexisting severe comorbidities, emergency surgery, and medical admission were identified as independent predictors of treatment withdrawal.^[27] Another study involving 269,000 patients in the United States found that the likelihood of withholding or withdrawing LST was high in female patients aged >65 years and low among patients of Black ethnicity.^[28]

Limitations

Our study has certain limitations. It was a single-center study with a small sample size, and the retrospective study design may have introduced potential biases, such as selection bias. It should be noted that our hospital is in a tourist area, resulting in a higher proportion of non-local individuals being admitted. This situation may lead to the Berkson bias. Furthermore, we did not examine the decision-making process for withdrawing or withholding LST in survivors, which may have affected the comparisons with previous studies. A study on European ICUs also found that the prevalence of limitations in life-prolonging therapies changed with time.^[29] Therefore, it is reasonable to infer that practices for withholding or withdrawing LST will change over time. However, due to the limited sample size, it was not feasible to analyze the temporal effects. Further research in multicenters of different regions is warranted to compare the decision-making processes in this context.

Conclusion

The decision-making process for withholding or withdrawing LST may vary based on factors such as age, residential location, per capita income, and the primary diagnosis. It is crucial for healthcare professionals and policymakers to acknowledge these variations and consider local ethics and traditions during discussions and decision-making regarding withholding or withdrawing LST.

Conflict of interest statement

The authors declare no conflict of interest.

Author contributions

Zhao Y and Xing Q collected data and draft the manuscript; Quan X reviewed the draft and statistics; Wang T contributed to project administration and supervision. All authors have read and approved the final manuscript.

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Ethical approval of studies and informed consent

The study followed the principles of the Declaration of Helsinki as revised in 2013. This study was approved and written informed consent was waived by the Ethics Committee of Hainan Hospital of Chinese PLA General Hospital (no. 301hn112017563, 2017.05), owing to the anonymized retrospective nature of the analysis.

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