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End-of-life Decisions in Intensive Care Medicine–Shared Decision-Making and Intensive Care Unit Length of Stay

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Abstract

Background Most deaths on the intensive care unit (ICU) occur after end-of-life decisions (EOLD) have been made. During the decision-making process, responsibility is often shared within the caregiver team and with the patients' surrogates. The intensive care unit length of stay (ICU-LOS) of surgical ICU-patients depends on the primary illness as well as on the past medical history. Whether an increasing ICU-LOS affects the process of EOLD making is unknown.

Methods A retrospective analysis was conducted on all deceased patients ($n = 303$) in a 22-bed surgical ICU of a German university medical center. Patient characteristics were compared between surgical patients with an ICU-LOS up to 1 week and those with an ICU-LOS of more than 7 days.

Results Deceased patients with a long ICU-LOS received more often an EOLD (83.2 % vs. 63.6 %, $p = 0.001$). Groups did not differ in urgency of admission. Attending intensivists participated in every EOLD. Participation of surgeons was significantly higher in patients with a short ICU-LOS (24.1 %, $p = 0.003$), whereas nurses and the patients' surrogates were involved more frequently in patients with a long ICU-LOS (18.8 %, $p = 0.021$ and 18.9 %, $p = 0.018$, respectively).

Conclusion EOLDs of surgical ICU-patients are associated with the ICU-LOS. Reversal of the primary illness leads the early ICU course, while in prolonged ICU-LOS, the patients' predicted will and the expected post-ICU-quality of life gain interest. Nurses and the patients' surrogates participate more frequently in EOLDs with prolonged ICU-LOS. To improve EOLD making on surgical ICUs, the ICU-LOS associated participation of the different decision makers needs further prospective analysis.

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Introduction

Most deaths on European intensive care units (ICUs) occur after an end-of-life decision (EOLD), a decision to limit life-sustaining treatment, has been made [1–7]. EOLDs generally define an abandonment of cardio-pulmonary resuscitation (Do-not-resuscitate—DNR). Frequently, a decision to withhold or to withdraw intensive care medicine therapeutic approaches (withhold/withdraw-life-support—WH/WDLS) is taken at the same time. EOLDs show a wide regional variety. They are associated with culture, religion, different laws and health care systems, medical selfconception, and public health [8–10]. The 5th International Consensus Conference in Critical Care recommended a "shared" approach for decision-making in EOLDs. The responsibility for the decision should be shared between the caregiver team and the patients' surrogates [11].

In surgical ICUs, responsibility for ICU patients often is shared between surgeons and intensivists [3, 5]. However, there is evidence that EOLDs are affected by administrative models and depend on the medical specialty with primary responsibility for the ICU [12, 13]. After complex and high-risk surgery, many patients are routinely admitted to the ICU for postoperative care. Therefore, surgical ICU-patients generally have a better prognosis than patients admitted to a medical ICU [14]. Surgical patients surviving the initial postoperative period but experience a prolonged ICU length of stay (ICU-LOS) are threatened by ICU-LOS associated risks like ventilator-associated pneumonia, catheter and urinary tract infections, persistent septic foci, or multiple organ dysfunctions [15]. As ICU-LOS-associated complications contribute to the patients' long-term outcome, we hypothesized that also the process of EOLD making will change with prolonged ICU-LOS.

Therefore, we conducted a retrospective analysis on our ICU where we process EOLDs according to the recommendations of the 5th International Consensus Conference in Critical Care. We compared the decision-making process in patients who received an EOLD and had a short ICU-LOS ($\leq$7 days) with those who had a prolonged ICU-LOS (>7 days).

Methods

The Medical Ethics Committee of Charité University Hospital approved this study (number of ethical approval EA1/292/10). Informed consent was waived due to the retrospective and observational nature of the study.

Setting

22-bed surgical ICU led by the Department of Anesthesiology and Intensive Care Medicine at Charité University Medicine with in-house consultant coverage 24 h per day, 7 days a week. Board-certified anesthesiology and intensive care medicine fellows are available in the ICU all day long every day. Additionally, there is continuous presence of two residents in the ICU. Daily rounds involve at least one consultant with board certification in intensive care medicine. Furthermore, at least once a day, there is a round that involves an attending specialist surgeon from each specialty that admitted the patient to the ICU.

Patients

The study includes all consecutively admitted ICU-patients who died between August 1st 2008 and September 1st 2011. In total, 303 (6.7 %) of 4,510 admitted patients died in the ICU. Medical patients were excluded and 226 surgical patients were analyzed (Fig. 1).

An EOLD, a Do-not-resuscitate (DNR) order, and an order to withhold and/or withdraw-life-support (WH/WDLS) were defined as described previously [3]. WH/WDLS limitations differentially included withholding or withdrawing therapies like endotracheal intubation, mechanical ventilation, renal replacement therapy, catecholamine infusions, surgery, antimicrobial therapy, and blood product transfusions.

Data collection

Data from vital signs monitors, ventilators, organ replacement systems, medication, daily ICU scores like the simplified acute physiology score II (SAPS II) and the sequential organ failure assessment (SOFA), and all medical or nursing events to the patient were prospectively recorded in an electronic patient data management system (PDMS) (Copra System, Sabachswalden, Germany). Documentation of ward rounds, progress notes, orders, and laboratory results are also completed electronically in this PDMS. Limitations of therapy were documented together with the time and the participants of EOLD conferences in the daily progress notes. Patients received an EOLD only when every participant of the EOLD conference consented to the decision and its several regulations.

Statistical analysis

Results are expressed as arithmetic mean $\pm$ standard deviation (SD) for continuous variables and frequencies

(%) for categorical variables, respectively. Due to the different sample sizes and the skewness of distributions, only non-parametric (exact) tests were applied.

Differences between groups were tested by the non-parametric (exact) Wilcoxon-Mann–Whitney test for independent groups. Frequencies were tested by the (exact) χ^2-test. A two-tailed p value < 0.05 was considered statistically significant. All tests were conducted in the area of exploratory data analysis. Therefore, no adjustments for multiple testing have been made. All numerical calculations were performed with *IBM SPSS Statistics*, Version 22.

Results

During the observation period, 780 (17.3 %) of the 4,510 patients who were admitted to the ICU had an ICU-LOS greater than seven days. Before discharge, 134 (17.2 %) of these patients and 169 (4.5 %) of the patients with an ICU-LOS ≤7 days died ($p < 0.001$). EOLDs were taken in 167 (73.9 %) of the 226 surgical patients. Patients' characteristics and differences in baseline comorbidities, ICU severity scores, organ replacement technology, and advanced care planning for the different groups are presented in Table 1.

Patients with a short ICU-LOS did not differ from patients with a long ICU-LOS in elective or emergency admissions to the ICU ($p = 0.126$). However, patients who received an EOLD died less often after elective surgery in the group with a short ICU-LOS. In this group also more patients died after emergency surgery [20.6 % after elective and 64.7 % after emergency admission ($n = 68$) for ICU-LOS ≤7 days vs. 30.3 % after elective and 43.4 % after emergency admission ($n = 99$) for ICU-LOS >7 days ($p = 0.024$)].

Every patient with an EOLD had a DNR order. 157 (94.0 %) of EOLD patients also had a WH/WDLS order. Rates for EOLDs differed significantly between ICU patients with a short ICU-LOS compared to a long ICU-LOS. Patients with a short ICU-LOS less often received DNR orders [63.6 % ($n = 107$) for ICU-LOS ≤7 days vs. 83.2 % ($n = 119$) for ICU-LOS >7 days ($p = 0.001$)] and less often received WH/WDLS orders [58.9 % ($n = 107$) for ICU-LOS ≤7 days vs. 79.0 % ($n = 119$) for ICU-LOS >7 days ($p = 0.001$)]. The cause of death in patients who died without an EOLD did not differ between patients with a short ICU-LOS and those with a long ICU-LOS (Tab. 1

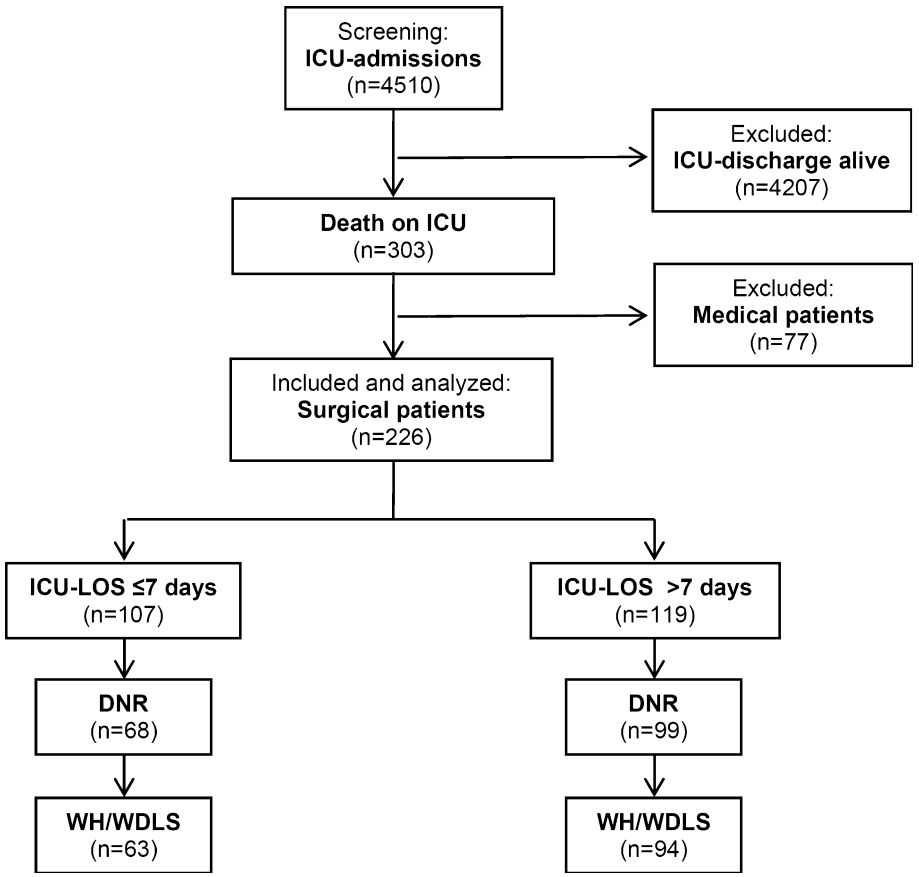

Fig. 1 Consort diagram ICU = intensive care unit; DNR = Do-not-resuscitate order; WH/WDLS = Withhold/withdraw-life-support order

Table 1 Characteristics of surgical patients who died in the intensive care unit between August 2008 and September 2011

	All		ICU-LOS ≤7		ICU-LOS >7		p^a
	$n = 226$		$n = 107$		$n = 119$		
Age, years, mean (± SD)	71.6	(± 11.2)	72.6	(± 11.1)	70.7	(± 11.2)	0.094
Gender, male, *n* (%)	148	(65.5)	74	(69.2)	74	(62.2)	0.271
Urgency of surgery, *n* (%)							
Elective	65	(28.8)	29	(27.1)	36	(30.3)	0.126
Non-planned	49	(21.7)	18	(16.8)	31	(26.1)	
Emergency	112	(49.6)	60	(56.1)	52	(43.7)	
Comorbidities, *n* (%)							
Liver cirrhosis	21	(9.3)	7	(6.5)	14	(11.8)	0.177
Portal hypertension	10	(4.4)	4	(3.7)	6	(5.0)	0.752
Status post esophageal bleeding	6	(2.7)	2	(1.9)	4	(3.4)	0.686
Hepatic encelopathy	2	(0.9)	1	(0.9)	1	(0.8)	1.000
Cardiac insufficiency NYHA IV	50	(22.1)	19	(17.8)	31	(26.1)	0.134
Chronic pulmonary disease	55	(24.3)	19	(17.8)	36	(30.3)	0.032
Chronic obstructive pulmonary disease (COPD)	43	(19.0)	16	(15.0)	27	(22.7)	0.139
Lung fibrosis	2	(0.9)	1	(0.9)	1	(0.8)	1.000
Terminal renal insufficiency	32	(14.2)	11	(10.3)	21	(17.6)	0.113
Steroid medication	9	(4.0)	3	(2.8)	6	(5.0)	0.505
Chemotherapy	6	(2.7)	4	(3.7)	2	(1.7)	0.426
Immunosuppression therapy	5	(2.2)	2	(1.9)	3	(2.5)	1.000
AIDS	0	(0.0)	0	(0.0)	0	(0.0)	1.000
Leukemia	1	(0.4)	0	(0.0)	1	(0.8)	1.000
Lymphoma	2	(0.9)	2	(1.9)	0	(0.0)	0.223
Metastasing cancer	17	(7.5)	11	(10.3)	6	(5.0)	0.136
Severity scores, mean (± SD)							
SAPS II	60.0	±17.2	63.9	±18.2	56.5	±15.6	0.001
SOFA (day before EOLD/death)	10.5	±3.8	10.7	±4.1	10.6	±3.5	0.685
Organ replacement, *n* (%)							
Ventilation	220	(97.3)	102	(95.3)	118	(99.2)	0.104
Tracheostomy	69	(30.5)	4	(3.7)	65	(54.6)	<0.001
Dialysis	172	(76.1)	68	(63.6)	104	(87.4)	<0.001
IABP	73	(32.3)	41	(38.73)	32	(26.9)	0.067
VAD	34	(15.0)	16	(15.0)	18	(15.1)	0.971
ECMO/ECLS	24	(10.6)	10	(9.3)	14	(11.8)	0.556
Vasopressors	202	(89.4)	99	(92.5)	103	(86.6)	0.146
Blood products, *n*, mean (Min–Max)	28.4	(0–225)	17.0	(0–154)	38.6	(0–225)	<0.001
Advance directive with living and therapeutic will, *n* (%)	21	(9.3)	6	(5.6)	15	(12.6)	0.070
Advance directive with patient's surrogate decision maker, *n* (%)	21	(9.3)	9	(8.4)	12	(10.1)	0.665
Patients with an attorney during ICU stay, *n* (%)	110	(48.7)	21	(19.6)	89	(74.8)	<0.001

ICU-LOS intensive care unit length of stay, *EOLD* end-of-life decision, *SD* standarddeviation, *Min* minimum, *Max* maximum, *IABP* intra-aortic balloon pump, *VAD* ventricular assist device, *ECMO/ECLS* extracorporal membrane oxygenation/life system

[a] Between patients with an ICU-LOS ≤7 days and those with an ICU-LOS >7 days

suppl.). 30 (13.3 %) patients received a WH/WDLS order after having received a DNR order earlier. This stepwise escalation of EOLD occurred more often in patients with a long ICU-LOS than in those with a short ICU-LOS [22.7 % ($n = 107$) for ICU-LOS ≤7 days vs. 2.8 % ($n = 119$) for ICU-LOS >7 days ($p < 0.001$)]. Also after a first WH/WDLS order, 34 (28.6 %) patients with a long ICU-LOS but only nine patients (8.4 %) with a short ICU-LOS received additional orders for limitation of life support ($p < 0.001$).

DNR decisions on weekends did not differ between groups [16.2 % ($n = 68$) for ICU-LOS ≤7 days vs. 9.1 % ($n = 99$) for ICU-LOS >7 days ($p = 0.166$)]. WH/WDLS orders were not received more frequently during the week for patients with an ICU-LOS of more than 7 days [84.1 % ($n = 63$) for ICU-LOS ≤7 days vs. 91.5 % ($n = 94$) for ICU-LOS >7 days ($p = 0.156$)].

In patients with an ICU- LOS >7 days WH/WDLS, decisions were done more often during the normal working hours from 7 a.m. to 5 p.m. orders [88.3 % ($n = 94$) for ICU-LOS >7 days vs. 76.2 % ($n = 63$) for ICU-LOS ≤ 7 days ($p = 0.045$)]. 2.1 % ($n = 94$) of WH/WDLS orders were taken during the night from 10 p.m. to 7 a.m. in patients with a long ICU-LOS but 9.5 % ($n = 63$) in patients with an ICU-LOS ≤7 days ($p = 0.061$). No differences could be detected for DNR decisions ($p = 0.120$, $p = 0.112$ respectively).

Continuation and withholding/withdrawing of intensive care medicine therapeutic approaches did not differ between patients with an ICU-LOS ≤7 days and those with an ICU-LOS >7 days for ventilation ($p = 0.144$), intubation ($p = 0.181$), renal replacement therapy ($p = 0.058$), catecholamine infusions ($p = 0.404$), surgery ($p = 0.957$), antimicrobial therapy ($p = 0.308$), and blood transfusions ($p = 0.147$).

Attending intensivists were part of almost every DNR [98.5 % ($n = 68$) for ICU-LOS ≤ 7 days vs. 100 % ($n = 99$) for ICU-LOS >7 days ($p = 0.407$)] and WH/WDLS decision [98.4 % ($n = 63$) for ICU-LOS ≤7 days vs. 100 % ($n = 94$) for ICU-LOS >7 days ($p = 0.401$)]. The differences in participation frequencies of the different decision makers of the clinical team for DNR and WH/WDLS orders with regard to the ICU-LOS are shown in Fig. 2. Table 2 shows the differences in information and participation of the patient or the patients family/surrogate decision makers in the EOLD process.

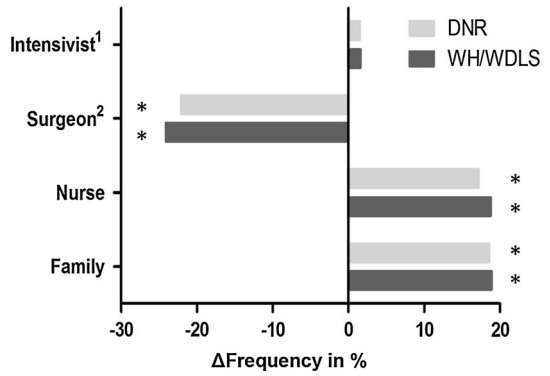

Fig. 2 Differences in participation frequencies of End-of-life decision makers according to the ICU-LOS. Differences of relative frequencies [Δ %] of documented health care professionals and family members/patients' surrogate decision makers participating in the end-of-life decision process for patients with an ICU-LOS ≤7 days versus patients with an ICU-LOS >7 days. A value of 0 means that decision makers participate equally in the decision-making process between patients with a long ICU-LOS and patients with a short ICU-LOS. DNR = Do-not-resuscitate order; WH/WDLS = Withhold/Withdraw-life-support order; [1] = Attendings, board certified in intensive care medicine; [2] = Attendings, board certified in the surgical specialty that admitted the patient to the ICU; * = $p < 0.05$

Discussion

In this retrospective analysis, three quarters (73.9 %) of surgical ICU-patients died after an EOLD. EOLDs were issued more often in patients with a prolonged ICU-LOS. Formal patient characteristics, the timing, and the practice of withholding or withdrawing intensive care therapy did not differ between patients with a short and a long ICU-LOS. However, a long ICU-LOS was associated with more complex EOLD making like escalating approaches from DNR to WH/WDLS and multi-step WH/WDLS decisions. Major differences were noted for ICU-LOS associated participation of members of the medical team and the patients or their substitutes in the EOLD-making process. While an attending intensivist took part in almost every EOLD discussion, surgeons participated predominantly in decisions for patients with a short ICU-LOS whereas nurses and the patients' family took part more often in EOLDs for patients with a long ICU-LOS.

Many surgeons and intensivists suspend DNR-orders in the immediate perioperative period especially in elective cases [13]. Furthermore, a higher SAPS II-Admission-Score in patients with a short ICU-LOS indicates that some of these patients might have died even before an EOLD process could be organized. Whether a patient receives an EOLD or not is not associated with higher ICU severity scores [3, 16]. Apart from chronic pulmonary diseases, the decedents of our cohort with a short ICU-LOS did not differ from those with a long ICU-LOS for formal criteria like patients' comorbidities, urgency of surgery, and advance directive rates. Analyzing the participation frequencies of the different members of the medical team in EOLD conferences, we noted a significantly higher participation of surgeons in patients with a short ICU-LOS than in those with a long ICU-LOS. Also the proportion of patients who were admitted to the ICU after elective surgery and received an EOLD was lower in the group with a short ICU-LOS. Surgery often is crucial to reverse critical and life-threatening illness [16]. High-risk surgery frequently goes hand in hand with extensive postoperative intensive care therapy. The assumption, that consent for an operation also covers all maximum therapy that might be necessary in the postoperative setting, is known as

Table 2 Information and participation of the patient, the patient's family, or his surrogate decision makers in EOLDs with respect to the ICU-LOS

	DNR			WH/WDLS		
	ICU-LOS ≤7 days ($n = 68$)	ICU-LOS >7 days ($n = 99$)	p[a]	ICU-LOS ≤7 days ($n = 63$)	ICU-LOS >7 days ($n = 94$)	p[a]
Patient was informed of EOLD, *n* (%)	2 (2.9)	4 (4.0)	1.000	2 (3.2)	4 (4.3)	1.000
Patient participated in EODL, *n* (%)	2 (2.9)	4 (4.0)	1.000	2 (3.2)	4 (4.3)	1.000
Family/Surrogate decision maker was informed of EOLD, *n* (%)	60 (88.2)	90 (84.9)	0.575	55 (87.3)	87 (92.6)	0.273
Family/Surrogate decision maker participated in EOLD, *n* (%)	31 (45.6)	66 (66.7)	0.007	30 (47.6)	65 (69.1)	0.007

DNR do-not-resuscitate order, *WH/WDLS* withhold/withdraw-life-support order, *ICU-LOS* intensive care unit length of stay, *EOLD* end-of-life decision

[a] Between patients with an ICU-LOS ≤7 days and those with an ICU-LOS >7 days

"surgical buy-in" [17]. This is thought to be the main reason why surgeons generally are more reluctant to withdraw life-support from their patients than physicians of medical disciplines [12, 18]. However, our findings support this view for patients with a short ICU-LOS. During the early course in the ICU, the primary postoperative medical condition seems to drive EOLDs that require close communication with the surgical partners. The medical team focuses on curing the critical illness based on the patient's active consent for the operation.

Around 90 % of the families/surrogate decision makers are informed of an EOLD irrespective of the ICU-LOS. However, in a condition of medical futility, a patient or his surrogate decision makers can neither legally nor ethically request further medical treatment [19]. Therefore, especially in patients with a short ICU-LOS, they might just be informed about the EOLD but do not participate actively in the decision-making process.

With ICU-LOS prolonging, the survival of surgical ICU-patients is mainly determined by the past medical history [16, 20]. We noted a higher frequency of chronic pulmonary diseases in patients with a long ICU-LOS in our study group. In accordance with the literature, decedents after a long ICU-LOS more frequently have had a tracheotomy, renal replacement therapy, and received more blood products [21, 22]. Long-term ventilation and the chronic need for dialysis are known to have a major impact on a patient's quality of life [23–25]. The higher rate of patients with a legal attorney found in the group with a long ICU-LOS can be explained by a good adherence of the medical staff to a standard operating procedure (SOP) existing on our ICU. This SOP states that for every patient that is expected to be ventilated for more than 48 h and, therefore, will be incapable to express his will during that time, the assigned ICU physician has to contact the district court to establish a formal legal attorney for this patient.

In patients with a long ICU-LOS EOLD, multi-step approaches in DNR and WH/WDLS decisions were significantly higher. This indicates that EOLD conferences are held regularly during a patients' stay in the ICU. Regular EOLD conferences are a key element of high-quality ICU-care [26]. Predominantly scheduling WH/WDLS discussions at regular working hours in patients with an ICU-LOS >7 days can be a sign of less acute dynamics in the severity of illness after the initial perioperative period of these patients. As ICU outcome prognosis is complex and unpredictable, especially after a prolonged ICU course, there is an increased need for the caregiver team and the patients' surrogates to discuss the patient's most likely preferences [11, 27]. Also advance directives whose completion rates remain low anyway are often difficult to interpret in an ICU setting [3, 28–30]. Nurses participated in a third, the patients' family or the surrogate decision makers in one half of all EOLDs for patients with a short ICU-LOS. Both nurses and the patients' family were more often involved in EOLDs of patients with a long ICU-LOS. ICU nurses generally have the closest and most intimate contact to the patient and his family. Therefore, they play an essential role to elicit a patients' most likely will and guide the patient and his family through the decision-making process and end-of-life care [31, 32].

Based on the retrospective character of our study, our results are mainly descriptive and hypothesis generating. However, to improve the quality of end-of-life care in the ICU recurrent review of the current daily, clinical practice is crucial and cannot be outlined by questionnaire-based studies only. In an ICU where we practice EOLDs according to international and national recommendations, this ICU-LOS-dependent participation of the different members of the healthcare team, as well as the patient and his family or his surrogates was unexpected and to our knowledge was never reported so far [11, 26].

Further prospective analyses are required to elucidate whether each of the decision makers is required for an EOLD in relation to the actual ICU-LOS of the patient. It is known that adequate and standardized documentation of EOLDs improves patients' and family outcomes [33]. It also helps to reflect the therapeutic goals for any ICU patient [34]. Additional standardization of EOLD-documentation with statement sections for each of the different decision makers could help to further explore the process of shared decision-making with a special regard to the ICU-LOS. Standardized documentation can also be utilized as a help to formulate a patient's most likely will. In fact, it is this predicted patient-will that should guide the whole EOLD-making process.

Conclusion

EOLDs of surgical ICU-patients are associated with the ICU-LOS. While in the early course of the ICU-stay, the reversal of the primary illness determines clinical decision-making, the patients' presumed will and the expected post-ICU-quality of life become more important in a prolonged ICU-LOS. Also nurses and the patients' surrogates participate more frequently in EOLDs with a prolonged ICU-LOS. To improve EOLD making on surgical ICUs, the ICU-LOS associated participation of the different decision makers needs further prospective analysis.

Conflict of interest none.

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