

End-of-life management in intensive care units: a multicentre observational prospective cohort study

Marina Z. Alliprandini¹, Andressa J. Ferrandin¹, Adriana Fernandes², Mariana C. Belim¹, Mariana M. Jorge¹, Bruno H.B. Colombo¹, Jordana M. Yaguchi¹, Thais T. Chung³, Amaury C. Jorge³, Pericles A.D. Duarte^{1,4}

¹Hospital Universitario do Oeste do Parana, Cascavel, Parana, Brazil

²Hospital Sao Lucas – FAG, Cascavel, Parana, Brazil

³General ICU, Hospital Universitario do Oeste do Parana, Cascavel, Parana, Brazil

⁴Hospital do Cancer/UOPECCAN, Cascavel, Parana, Brazil

Abstract

Backgrounds: The study was conducted to evaluate intensive care unit (ICU) patients that ultimately died but could have met criteria for end-of-life management/palliative care (ELM-PC), and to analyse the application of components of palliative care, either “unperformed procedures” or elements of “futile/unnecessary treatment”.

Methods: An observational prospective cohort in five ICUs in Southern Brazil. Adult patients who died were evaluated, searching for criteria for ELM-PC. The correct application of nine preselected items by the ICU team was studied.

Results: Among 253 admissions, 52 patients died; among these, 38.5% met criteria for ELM-PC. Among ELM-PC candidates ($n = 20$), the ELM-PC was started later (after day 3) in 60%, and only three patients received adequate palliative care. “Analgesia” and “daily family interviews” were the most correctly applied ELM-PC elements. “Terminal extubation/weaning” was not performed in any of the patients. A reduction in the lifespan from the onset of ELM-PC to death was observed in patients who underwent “correct” interventions – 66.6% died on the first day of ELM-PC.

Conclusions: In a patient cohort from a low-medium-income country, one-third of patients who died in the ICU had criteria (indications) for ELM-PC; however, the palliative care was adequately performed for only 15% of patients, with great heterogeneity and delays regarding its initiation.

Key words: palliative care, intensive care unit, death, patient comfort.

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ADRES DO KORESPONDENCJI:

Dr. Pericles A.D. Duarte, Hospital Universitario do Oeste do Parana. Av. Tancredo Neves, 3224 – Santo Onofre, Cascavel – PR, 85806-470, Parana, Brazil
e-mail: pericles.duarte@uol.com.br

With the impressive improvements in medical care in recent years, it is to be expected that intensive care unit (ICU) care would result (as well as reducing mortality from serious critical illnesses) in increased comfort and dignity for patients and their families, thus reducing their suffering. However, the latter objective is still far from a reality, and the practice of applying futile support therapies is still common in the ICU setting, particularly among patients who eventually die in the hospital [1].

It has been estimated that beds intended for intensive care account for 13.4% of all hospital beds in the USA, representing a cost of 0.56% of the country's gross domestic product (GDP). Despite the greater use of hospices and end-of-life palliative care, approximately one in five Americans die in an ICU [2]. In low- and medium-income countries, there are a lack of data about the rate of hospitalisation and death in

the ICUs, but it is estimated that there were approximately 350,000 ICU hospitalisations in 2017 in Brazil, with a mortality rate of 11% and an average length of hospitalisation of 15 days [3].

With the increased rate of hospital admissions for intensive treatment combined with the ageing of a population with more comorbidities, “end-of-life” care has become increasingly necessary. Globally, it is estimated that more than 40 million people need palliative care at any one time, and 86% do not have access to it [4].

It has been shown that the palliative care not only increases humanisation and better treatment for dying intensive care patients, but the appropriate application of palliative care allows for a reduction in the length of the ICU stay, the costs related to the treatment, and a better quality of care even for non-dying patients. In addition, it is known that

a more proactive approach by the health team to recognise and implement palliative care has resulted in a reduction in the time to death of the patient and a better acceptance of the death by the relatives, with relief of their psychiatric symptoms in the period following mourning [5, 6]. Thus, palliative care has become increasingly important in intensive care. The concept of dying with dignity in the ICU implies that although clinicians may renounce some treatments, care can be improved as death approaches, and this requires more humanisation by the entire assisting team [1].

The aim of the study was to evaluate, among patients hospitalised in Brazilian ICUs, who ultimately died, those with criteria for performing and applying end-of-life management/palliative care (ELM-PC); then, among these patients, to analyse the application of elements of ELM-PC, either unperformed (which should have been applied) or used as part of futile treatment (which should not have been performed, but was applied).

METHODS

A prospective observational cohort study was carried out in five ICUs from five different hospitals (one teaching public, one philanthropic, and three private) in the city of Cascavel (southern Brazil). The study was conducted in accordance with the recommendations of Resolution 466/2012 of the Brazilian National Council of Health. This study was approved by the Research Ethics Committee of the Universidade Estadual do Oeste do Paraná-UNIOESTE. Owing to the nature of the study (observational, non-interventional), patient's or family's informed consent was waived.

All adult patients admitted to these ICUs during a period of 30 days were evaluated and followed up to ICU discharge (alive or dead). Patients who died in the ICU and met the pre-determined criteria (see below) for final criteria (indications) for palliative management were included. The inclusion criterion was: adult patients fulfilling criteria, according to the researchers but not necessarily to the medical team treating the patient, for ELM-PC. This criterion (indication to apply ELM-PC) could be reached at any point of ICU hospitalisation, not just at admission.

The only exclusion criterion was age less than 18 years.

The "family discussion" item refers to the daily conversation by the doctor and/or the ICU assistant team with the patient's family for updating information and discussing eventual therapeutic planning and palliative care as well as end-of-life decisions. In Brazil, according to a federal judge's rule (widely accepted by civil society), it allowed end-of-life decisions to be made by the assistant doctor, provided

that it is supported by the authorisation and consent of the patient or his/her surrogate. However, the discussion with the patient's family was not part of the data collection. Thus, the opinion of the relatives was not evaluated by the researchers, as well as their engagement in the care of the end-of-life patient.

Considering that there were no specific Brazilian guidelines about palliative care/end-of-life care in intensive care patients at the time of the study, the criteria used during the discussion with family members were based only on bibliographic reviews including international guidelines [7] and elaborated by the authors themselves.

Note: these criteria were used for the purpose of the study by the researchers, without communication with the assistant team, which therefore did not use these criteria for patient management. The study was observational, without any influence on the health professionals treating the patients included in the study. Thus, some patients could have been considered to be candidates to be submitted to ELM-PC by the researchers, but they were not necessarily handled as such by the assistant team. Similarly, there was no possibility or attempt by researchers to try to "correct" any "errors" detected.

The definition for the inclusion criteria and the evaluation of the therapies employed were reached through periodic weekly meetings and constant communication among the members of the research team, aiming to discuss the cases and assess whether the patients met criteria for ELM-PC and how they were being performed. At the end of the study, ICU assistant teams were notified of the study findings.

Criteria for indication of end-of-life decisions/management and palliative care:

- patient with a limited life expectancy = death is expected in the next few weeks or months, even with adequate therapy (e.g. terminal cancer);
- patient with an acute pathology that is difficult to control in an unfavourable clinical setting, in which the cost-benefit of choosing an aggressive therapeutic approach is poor or questionable;
- patient with an acute disease/medical condition (e.g. trauma or acute coronary syndrome) that is very severe but potentially reversible, but due to the patient's current condition and/or sequelae (e.g. neurological), the expected quality of life or neurological prognosis is poor or irreversible as defined by a Glasgow Coma Scale less than or equal to 5 points and/or signs of poor prognosis after cardiopulmonary arrest (e.g. persistent myoclonus following cardiac arrest due to acute coronary syndrome, with severe neurological sequelae and clinical instability);

- patient with a chronic disease that causes intense suffering or limitations resulting in a poor quality of life, in which the current (acute) clinical condition is only a consequence of this disease, and its reversal will not modify the quality of life or even worsen it, and thus the imposition of limits on therapeutic interventions is an option considered more dignified to the patient (e.g. acute-on-chronic severe, terminal COPD);
- other criteria or situations defined *a posteriori* by the research team.

Elements (strategies and care) assessed as (a) necessary or (b) unnecessary and futile to use in the patient who needs ELM-PC. Note: these compounds were also defined and evaluated by the research team, but not reported to the healthcare team.

- Adequate analgesia and/or sedation, with analgesia monitoring.
- Avoiding 'high' ventilatory parameters (by limitation of PEEP and keeping FiO₂ in low values) in case of further respiratory worsening (e.g. acute respiratory distress syndrome development), OR avoiding orotracheal intubation [OTI], OR performing terminal extubation/weaning.
- Reducing doses of vasoactive drugs (VAD), or not using them in case of further haemodynamic deterioration.
- Allowing/encouraging the family's presence for longer times in the ICU.
- Daily conversation with the family.
- Dialogue and participation of the multiprofessional team in the palliative care process.
- Avoiding "unnecessary" exams (including daily "routine" exams and chest X-rays).
- Avoiding "unnecessary" procedures, such as:
 - minor procedures: e.g. frequent capillary glycaemia checks;
 - moderate procedures: e.g. central venous catheter insertion, arterial catheter for monitoring blood pressure, initiating parenteral nutrition;
 - major procedures: e.g. haemodialysis.
- Avoiding cardiopulmonary resuscitation (CPR).
- "Adequate" or "inadequate" ELM-PC:
 - "Adequate" ELM-PC was defined when at least two of the abovementioned elements were not correctly applied. If three or more of them were not applied, the ELM-PC was considered "inadequate".

For verification of whether or not ELM-PC was applied, medical records were evaluated and interviews with the assisting staff were performed after the patient's death. Possible disagreements over the determination of the "correct (complete)" or "incorrect" ELM-PC were decided by consensus at periodic meetings of the research team.

This study was observational, so there were no interventions undertaken. Clinical management like strategies for diagnosis, monitoring, therapy, and eventual end-of-life decisions were performed by the healthcare teams, without any interference or opinions offered from the researchers. Besides this, the healthcare team did not have access to the researchers' opinion about whether the patient should be on ELM-PC or not.

Statistical analysis

Descriptive statistical analysis was performed, and percentages were expressed as frequency, mean, and standard deviation. The analysis of baseline and epidemiological data and outcome were conducted using Student's *t*-test, analysis of variance, and Tukey's test or χ^2 test (for categorical variables), applying a significance level of $P < 0.05$.

RESULTS

During the study period, 253 patients were admitted to the five participating ICUs and were followed up until ICU discharge. Among these, 201 (79.4%) patients were discharged alive from the ICU. Among the patients who died in the ICU, 20 (38.5%) met the criteria for applying ELM-PC. Among these 20 patients, the ELM-PC was correctly performed (defined as two or less unapplied criteria) only in three patients.

Table 1 represents the demographic clinical profile and outcomes of the hospitalised patients.

Among the patients who died, patients with ELM-PC criteria were older and had a lower pre-hospital Karnofsky score (i.e. worse functional status) than those without indications for ELM-PC. In addition, patients with ELM-PC criteria tended to have a longer ICU time, although the difference was not significant (Supplementary Table 1).

Among the patients that fulfilled ELM-PC criteria there was great heterogeneity as to the day of onset of the ELM-PC by the attending physicians; in 20% of patients it was started on the first day of ICU stay, in 40% – after the third day, while for 20% of the patients with ELM-PC criteria this strategy was never initiated. The most common criteria (indication) for ELM-PC was "chronic disease with limited life expectancy" – in 50% of cases. There was also great heterogeneity regarding the performance of palliative care components. Among the elements/procedures that should have been performed and that were "adequately" performed, the most common were "analgesia" (including monitoring) and "daily interview with the family"; in turn, "extubation/terminal weaning" and "avoiding tracheal intubation" were not performed in any patient. Among the actions "which should not have been performed, but were

TABLE 1. Clinical-demographic profile and outcomes of the patients ($n = 253$)

Factor	Patients discharged alive from the ICU, $n = 201$	Death in ICU, $n = 52$		
		Patients who had criteria* for ELM-PC, $n = 20$		Did not have criteria* for ELM-PC, $n = 32$
		ELM-PC was 'adequately' performed, $n = 3$	There were ≥ 3 non-applied criteria for ELM-PC, $n = 17$	
Age, years, mean \pm SD	60.2 \pm 18.0	66.3 \pm 13.9	67.8 \pm 19.3	63.7 \pm 16.2
< 40	16.4%	0	17.6%	15.6%
41–60	28.4%	33.3%	11.8%	18.8%
61–75	36.8%	33.3%	11.8%	43.7%
> 75	18.4%	33.3%	58.8%	21.9%
Male gender, %	57.2	66.7	47.0	42.3
APACHE II, mean \pm SD	16.0 \pm 7.8	30.7 \pm 6.1	28.4 \pm 8.4	26.3 \pm 8.4
SOFA on admission, mean \pm SD	4.7 \pm 3.8	11.7 \pm 1.5	10.1 \pm 4.7	10.7 \pm 3.7
Admission cause, %				
Trauma	4.5	0	5.9	3.1
Medical	42.8	66.7	76.5	59.3
PO elective	46.3	33.3	11.7	28.1
PO emergency, non-trauma	6.5	0	5.9	9.4
Comorbidities, %				
SH	56.2	66.7	41.2	53.1
DM	22.4	33.3	29.4	18.7
Cancer (actual)	10.4	66.7	17.6	18.7
COPD	4.0	33.3	17.6	6.25
CHF	12.9	0	11.8	9.37
AIDS	0.5	0	0	0
CRF (with or without dialysis)	9.4	0	11.8	9.37
Karnofsky pre-hospital, mean \pm SD	82.4 \pm 13.2	36.7 \pm 5.8	60.6 \pm 21.0	75.9 \pm 14.1
≤ 40	1.0%	100%	23.5%	0
50–70	18.4%	0	53.0%	40.6%
80–100	80.6%	0	23.5%	59.4%
VAD use in hours, mean \pm SD				
0 (did not use)	63.7%	0	5.9%	18.7%
1–12	9.0%	66.7%	23.5%	15.6%
13–48	11.4%	33.3%	17.6%	28.1%
> 48	15.9%	0	47.0%	37.5%
Antibiotic use, %	51.2	33.3	82.4	68.7
Complications in ICU, %				
AKI	11.9	0	64.7	59.3
ARDS	2.5	0	11.8	12.5
MV time in days, mean \pm SD				
0 (did not use)	67.2	0	5.9	12.5
1	15.9	66.7	11.8	25
2–5	10.4	33.3	58.8	50
> 5	6.5	0	23.5	12.5
ICU length of stay in days, mean \pm SD				
1	23.4%	33.3%	5.9%	25%
2–4	58.2%	33.3%	23.5%	40.7%
5–10	11.4%	33.3%	47.1%	9.3%
> 10	7.0%	0	23.5%	25%

*The criteria ('indication' or not) for ELM-PC was defined a posteriori by the researchers' team (without influencing the decision of the healthcare team). ELM-PC – end-of-life management and palliative care, ICU – intensive care unit, SD – standard deviation, APACHE – Acute Physiology and Chronic Health Evaluation score, SOFA – Sequential Organ Failure Assessment, PO – postoperative, SH – systemic hypertension, DM – diabetes mellitus, COPD – chronic obstructive pulmonary disease, CHF – congestive heart failure, CRF – chronic renal failure, VAD – vasoactive drugs, AKI – acute kidney injury, ARDS – acute respiratory distress syndrome, MV – mechanical ventilation

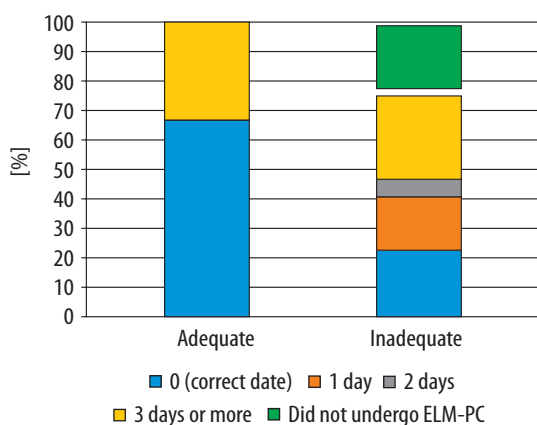


FIGURE 1. Patients with ELM-PC criteria ($n = 16$): time (days) of delay before starting ELM-PC (number of days between the day ELM-PC should have started and the day it was actually started). Note: excluded patients in whom ELM-PC was never performed ($n = 4$)

ELM-PC – end-of-life decisions and palliative care

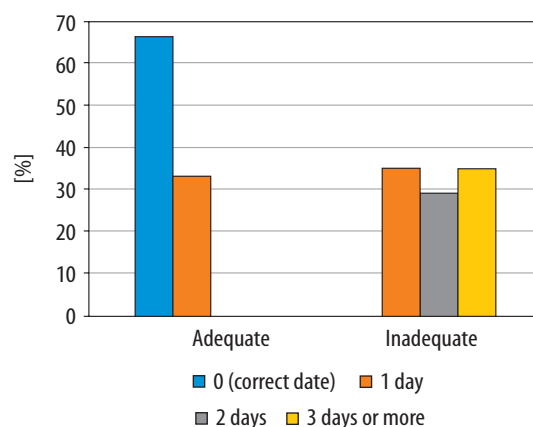


FIGURE 2. Patients with ELM-PC criteria ($n = 20$): time (days) between onset of ELM-PC and death (if ELM-PC was not initiated, it was considered to be 0 days)

ELM-PC – end-of-life decisions and palliative care

done” (i.e. futile therapies), the most frequent were “daily routine tests” and “maintain/increase the VAD dose” (Table 2, Figures 3 and 4).

When comparing the patients in whom ELM-PC was applied “adequately” with those with “not adequate” management (based on the number of components performed), it was verified that, in addition to the number of actions actually applied, there were also differences in the onset time of ELM-PC implementation: in the group with “inadequate” ELM-PC, in 29.5% it was started with more than three days of delay (i.e. after the day when it should have been started). The time between the onset of ELM-PC and death also tended to be higher in the group with “inadequate” ELM-PC (Table 2 and Figures 1 and 2).

Regarding the number of days between the onset of ELM-PC and death, 66.6% of the patients died on the day of the ELM-PC onset and 33.3% died one day after. In the group considered as “inadequate”, no patient died on the day of ELM-PC initiation, 35.3% of patients died one day after, 29.4% two days after, and 35.3% three or more days after ELM-PC had been implemented (Figure 2).

DISCUSSION

In a heterogeneous population of critically ill patients, it was found that among patients with an indication (any criterium) for ELM-PC, this strategy was adequately performed only in 15% of them, with great heterogeneity for its application.

Prognostic mortality and severity indexes (such as APACHE II and SOFA scores) were predictive of the patient’s outcome and consistent with the literature, although only APACHE II, but not SOFA, was correlated with a higher chance of identifying the need for ELM-PC [8]. These data are reinforced by

the finding that an important predictor of ELM-PC among deceased patients is their previous functional status, indicated by the Karnofsky index and age, rather than the severity of their current clinical status per se.

Despite the natural heterogeneity of the causes of mortality in ICU patients, one of the most common is multiple organ failure secondary to persistent systemic poor tissue perfusion. Such a condition, in the current context of intensive medicine, can drag on for days and even weeks, sometimes creating a situation of a “chronically critical” patient [9–11]. The identification of such a situation and eventual decision to apply end-of-life management for some of these patients is often difficult and may cause intense suffering of family members [12].

When only those patients who died in the ICU were evaluated, a significant proportion (39%) had eventual criteria (indication) for ELM-PC, although this indication could have arisen at any time during hospitalisation. End-of-life care has become an increasingly important part of medical care. In the Netherlands, the incidence of end-of-life decisions rose from 39% in 1990 to 58% in 2015 [13]. Thus, in the ICU, this strategy has been increasingly incorporated. However, the applicability of palliative care practices by ICU teams has been variable, particularly regarding withdrawal of life support – especially respiratory support [14–17]. A Brazilian study of patients who died in ICUs reported a very high incidence of limiting life support interventions: 83% of adults and 44% of children were managed in that way. However, the definition of ELM-PC use was based on the definition used by the healthcare team itself (as described in the chart), and most of the time the only strategies used were to avoid CPR and reduce/avoid the use of VAD. More importantly,

TABLE 2. Characteristics of patients with criteria (indication) for ELM-PC ($n = 20$)

Factor	ELM-PC was done 'adequately' (≤ 2 unperformed criteria), $n = 3$	There were ≥ 3 unperformed ELM-PC criteria, $n = 17$
Timing of ELM-PC initiation		
1 st ICU day	66.6 %	11.8%
2 nd or 3 rd ICU day	33.3 %	17.7%
$\geq 4^{\text{th}}$ ICU day	0	47.0%
ELM-PC was never performed	0	23.5%
Type of ELM-PC indication (only one per patient)		
Patient with chronic/subacute disease and limited life expectancy (death is expected within the next few weeks or months), even with adequate therapy	66.6%	47.0%
Patient with an acute clinical situation with difficult clinical control, in which the therapeutic cost-benefit is poor or questionable	0	23.5%
Patient with clinical condition/acute illness that is potentially reversible, but due to current conditions and/or sequelae (e.g. neurological), quality of life or neurological prognosis is poor or irreversible	0	11.8%
Patient with a chronic disease with great suffering or limited quality of life, in which the current clinical condition is only a consequence of this disease, and its reversal will not modify the quality of life (or even worsen it), in which the imposition of therapeutic limitations (end-of-life support) is an option considered more dignified to the patient	33.3%	17.7%
Adequately performed ELM-PC strategies		
Appropriate analgesia	100%	88.2%
Adequate sedation	100%	47.0%
Limitation of ventilatory parameters: $\text{FiO}_2 < 30\%$	33.3%	41.2%
Limitation of ventilatory parameters: $\text{PEEP} < 6 \text{ cm H}_2\text{O}$	66.6%	29.4%
Monitoring of analgesia	100%	88.2%
Extubation or terminal weaning	0	0
Avoidance of tracheal intubation	0	0
More presence of family as companions in the ICU	100%	47.0%
Daily interview with the family	100%	76.5%
Avoidance or reducing VAD	66.6%	52.9%
Explaining and participation of a multi-professional team	66.6%	29.4%
Compounds that should not have been performed but were (futile therapies)		
Daily 'routine' blood tests	66.6%	52.9%
'Extra' blood tests (e.g. cultures)	0	17.6%
Minor procedures (e.g. glycaemic tests)	33.3%	41.2%
Moderate procedures (e.g. central venous catheter, paracentesis)	0	41.2%
Major procedures (e.g. haemodialysis)	0	17.6%
Increase VAD dosage	33.3%	64.7%
Modification of antibiotic therapy (escalation or new)	0	5.9%
CPR	0	0
Time (days) of delay before starting ELM-PC, mean \pm SD: Number of days between the day the ELM-PC should have been started, and the day when it actually started		
0 (it started on the 'correct day')	66.6%	29.4%
1	0	17.6%
2	0	5.9%
≥ 3	33.3%	29.5%
PC never started	0	23.5%
Time (days) between onset of ELM-PC and death (only among patients who underwent ELM-PC), mean \pm SD		
0 (death on the same day of ELM-PC onset)	66.6%	0
1	33.3%	35.3%
2	0	29.4%
≥ 3	0	35.3%

ELM-PC – end-of-life management and palliative care, ICU – intensive care unit, FiO_2 – fraction of inspired oxygen, PEEP – positive end-expiratory pressure, VAD – vasoactive drugs, CPR – cardiopulmonary resuscitation, SD – standard deviation

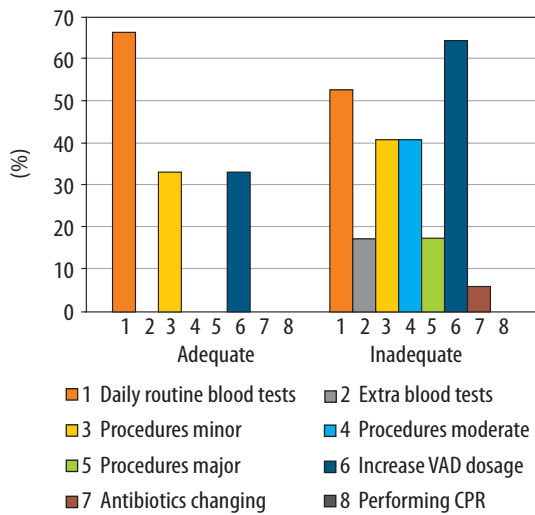


FIGURE 3. Patients with ELM-PC criteria (n = 20): items that should not have been performed (futile) but were done anyway

ELM-PC – end-of-life decisions and palliative care, VAD – vasoactive drugs, CPR – cardiopulmonary resuscitation

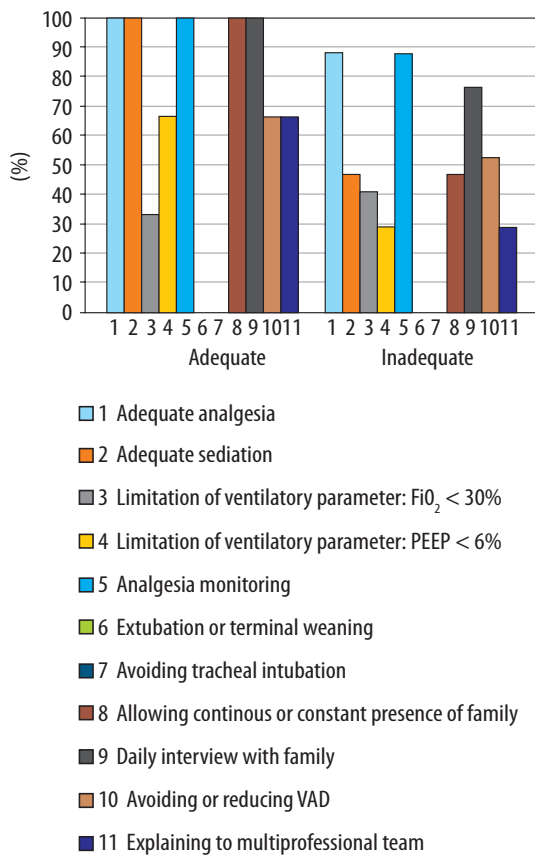


FIGURE 4. Patients with ELM-PC criteria (n = 20): PC items adequately performed

ELM-PC – end-of-life decisions and palliative care, FiO₂ – fraction of inspired oxygen, PEEP – positive end-expiratory pressure, VAD – vasoactive drugs

in most cases, the “decision for end-of-life management” had not been shared with the family [18]. Therefore, the discriminatory assessment of items of palliative care has been poorly studied, particularly in low-to-middle-income countries.

Although in our study most of the deceased patients with an ELM-PC criterium were elderly, 15% of the patients who died were younger than 40 years of age. Even among patients with terminal cancer, the probability of receiving adequate palliative care is greater in the elderly than in young people, where therapeutic obstinacy is more frequently encountered [19].

In a study about withholding and withdrawal practices for life-sustaining treatments, no association was found between withholding treatment and age. However, the authors of the study found a correlation between withholding treatment and the duration of ICU stay [20].

In our study, it was observed that patients who had an indication for ELM-PC had a trend of longer ICU stay when compared with those who died and had no indications for the limitation of intensive treatment. These data are in contrast with the results that can be found in the literature, where it is generally emphasised that patients receiving palliative care have a shorter ICU stay than patients who died without therapeutic limitations [21]. However, this apparent discrepancy could be explained by the fact that this was merely an observational study, with a high incidence and variability in the application of palliative care strategies: when comparing patients with “correct” or “inadequate” ELM-PC, there was a significant reduction in ICU time (and progression to death) in the group with the “correct” application. This corroborates the findings of interventional studies, in which the screening and application of palliative management reduced ICU hospitalisation time, particularly when applied early [22, 23].

There was great heterogeneity in the application of ELM-PC strategies. In particular, terminal weaning/extubation strategies as well as non-intubation were either very rarely or not actually performed. In a French survey interviewing physicians and nurses, there was a strong resistance to terminal extubation, particularly among nursing professionals [16]. It was found that end-of-life patients with non-cancer diseases (particularly chronic respiratory diseases and post-cardiac arrest neurological sequelae) have a longer mechanical ventilation time, more dialysis performed, and longer ICU stay than patients with cancer, and they receive lower quality palliative care [12, 24]. In our study, with only 25% of patients with ELM-PC having cancer, this quality-of-assistance gap of palliative care with more adequate end-of-life care for cancer patients was also seen, although the number of patients was very low.

It was also common to perform “routine” laboratory tests and X-rays in patients with criteria of ELM-PC, as well as performing futile major and minor pro-

cedures. Despite several studies suggesting intensity 'steps' of strategies and procedures to be withdrawn or avoided in end-of-life ICU patients, our study revealed a great heterogeneity in this approach, with the presence of several non-aggressive procedures that may have resulted in increased costs, patient discomfort, and family distress [12, 25]. Although in most cases this happened in situations where the end-of-life limitation decision had not even been made by the team, there were cases in which such procedures continued to be performed even in patients with defined (by the ICU team) "exclusive palliative care". Therefore, the need to promote protocols for screening and the effective implementation of ELM-PC in ICU teams is still a necessity, at least in the population and in the region addressed in this study. A significant relationship has been found between the application of a "do not resuscitate" (DNR) order and withholding noradrenaline treatment in the hours preceding the patient's death [20].

A clear finding of this study was that, in addition to the non-extensive and heterogeneous application of palliative care strategies, there was often a great delay before the effective initiation of this strategy. More importantly, in the present study, in patients with poor palliative management, there was a longer time to death, which further illustrates the magnitude of the problem.

It has been recognised that a better ICU palliative management improves overall patient care; on the other hand, the proactive search for the recognition and implementation of palliative management in the ICU decreases hospitalisation time and relieves the mourning of relatives, reducing their psychiatric symptoms in the weeks following death [5, 6].

This study has several limitations, some of them inherent to its nature, which may interfere with the application and generalisation of the results in different conditions.

Because it was an observational and not an interventional study, patient management, whether curative or exclusively palliative, was very heterogeneous. None of the study hospitals had an active palliative care team. Neither were there (for the study) specific protocols for palliative management, due to the observational nature of the study. Therefore, the analysis of the psychological, economic, or medical impact of any such protocols, applied either by a specific palliative care team or just by the typical ICU team, was not an objective of this study. In addition, the "bundle" of items for ELM-PC (i.e. which items should or should not have been included) selected for this study by the team of researchers is naturally incomplete given the complexity and heterogeneity of the patients, institutions, and situations. For example, eye and mouth care, management of constipation,

etc. have not been specifically evaluated. However, the authors, by using bibliographical review and their own experience, were looking for components considered more indispensable in palliative end-of-life management, reaching the above-mentioned by consensus within the research team.

Due to the sample size, the study was underpowered to detect factors that may interfere with the outcomes of patients with palliative care, whether they are intrinsic to the patients or related to the strategies used.

Because the study was observational, it was not assessed whether the patient was formally "labelled" (by the healthcare ICU team) as "end-of-life care" or not, which may hamper the joint analysis of the strategies.

Also the study did not address the family participation in the decision-making process regarding the beginning and maintenance of palliative management and end-of-life care.

Finally, the authors of this study were able to demonstrate that a palliative management protocol, which is well known to improve the quality of care in the ICU, including reducing costs and mortality [25–27], should be sought and propagated, and this study proved that this strategy is underutilised, at least in the ICUs studied.

CONCLUSIONS

In a study of low-to-middle-income country ICUs, one-third of patients who died in the ICU had a criterion (indication) for ELM-PC; however, the palliative care was adequately performed only in 15% of them. In addition, there was a prolonged delay in the initiation of ELM-PC. Among the components never or rarely applied, terminal weaning/extubation were the most prominent. For that reason, the need to promote protocols for screening and the effective implementation of ELM-PC in ICU teams is still a reality in the population addressed in this study. Similarly, establishing guidelines and regulations in each country could help improve palliative management and end-of-life care in ICU patients.

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