

# Daily compliance of the ABCDEF liberation bundle for patients in the intensive care unit: A retrospective descriptive study

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## ABSTRACT

**INTRODUCTION** Implementing the ABCDEF bundle has demonstrated improved outcomes in patients with critical illness. This study aims to describe the daily compliance of the ABCDEF bundle in a Chilean intensive care unit.

**METHODS** Retrospective observational study of electronic clinical records of nursing, physiotherapy, and medical professionals who cared for patients over 18 years of age, admitted to an intensive care unit for at least 24 hours, with or without mechanical ventilation. Daily bundle compliance was determined by considering the daily records for each element: Assess pain (element A), both spontaneous awakening trials (element B1) and spontaneous breathing trials (element B2), choice of sedation (element C), delirium assessment (element D), early mobilization (element E), and family engagement (element F).

**RESULTS** 4165 registered bundle elements were obtained from nursing (47%), physiotherapy (44%), and physicians (7%), including 1134 patient/days (from 133 patients). Elements E and C showed 67 and 40% compliance, while D, A, and B2 showed 24, 14 and 11%, respectively. For B1 and F, 0% compliance was achieved. Compliance was higher in patients without mechanical ventilation for A and E, while it was similar for D.

**CONCLUSIONS** Early mobilization had the highest compliance, while spontaneous awakening trials and family engagement had absolute non-compliance. Future studies should explore the reasons for the different degrees of compliance per bundle element in clinical practice.

**KEYWORDS** Intensive Care Unit, Delirium, Critical Illness, Patient Care Packages, Quality Improvement

## INTRODUCTION

Surviving critical illness is not free from cognitive [1], physical [2], or mental [3,4] complications, which may be present up to five years after discharge from an intensive care unit [5]. This set of complications is known as post-intensive care syndrome [6]. To mitigate this syndrome, a set of seven practices based on the best available scientific evidence called the "intensive care unit ABCDEF liberation bundle" was developed:

- A: Assess, Prevent, and Manage Pain.

- B: Both Spontaneous Awakening Trials (SAT) and Spontaneous Breathing Trials (SBT).
- C: Choice of Analgesia and Sedation.
- D: Delirium, Assess, Prevent and Manage.
- E: Early Mobility and Exercise.
- F: Family Engagement and Empowerment [7].

Bundle compliance in more than 6000 patients has been independently associated with an increased likelihood of survival and more days without delirium and coma, even after adjusting for age, illness severity, and mechanical ventilation duration [8]. Another similar study with more than 15 000 patients showed that implementation of all elements had clinically significant improvements in survival, use of mechanical ventilation, coma, delirium, and use of physical restraints, among others [9]. It has been shown that for every 10% increase in total bundle compliance, patients are 7% more likely to survive a hospital stay [8].

Compliance per bundle element varies between 7% and 92%, assessed mainly through surveys [10–14]. So far, only one study

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## MAIN MESSAGES

- Implementing the ABCDEF bundle improves outcomes in patients with critical illness.
- Assessing compliance with recording the ABCDEF bundle is key to designing strategies for improving its implementation.
- This is the first retrospective study with an interdisciplinary approach measuring compliance of recording the ABCDEF bundle.
- Some of the weaknesses of this study are the lack of clarity on the size and direction of the reporting bias due to using electronic clinical records to determine bundle compliance, the single-center data extraction, and the lack of a standardized data entering method based on the bundle criteria.

has been prospectively performed [9]. In Latin America, there are only reports from Argentina based on surveys of different clinicians [13,14]. In Chile, compliance with some bundle elements is only known from the national practices on sedation, analgesia, and delirium published in 2021 [15], providing an incomplete implementation baseline. However, compliance with the elements of the ABCDEF bundle in an intensive care unit that has not implemented it into its care process is unknown. Therefore, the objective was to retrospectively identify the daily compliance of each element of the ABCDEF bundle based on electronic clinical records in an intensive care unit of an academic center in Chile.

## METHODS

### Design

Retrospective descriptive observational study. We reviewed the electronic clinical records of an eight-bed adult clinical-surgical intensive care unit of an academic center in Chile between March and August 2019 to identify compliance with the elements of the bundle. The clinical record of the subjects was used, assuming the legal framework of Decree No. 41 within the Law 20.584, which establishes in Article 2 that "the clinical record is the mandatory instrument in which the information concerning the different areas related to the health and care of a person is recorded [16]", which has not only a judicial value but also a value for research and quality control of care in healthcare facilities [17]. The standards of the Declaration of Helsinki were followed for this study [18]. This study was reviewed and approved on June 25th, 2020, by the Ethics Committees of the Faculty of Medicine Clínica Alemana Universidad del Desarrollo (No. 2020-40) and the Critical Patient Centre at Clínica INDISA. Due to the retrospective nature of the study, a patient's informed consent waiver was approved. The results are reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies [19].

### Participants

All electronic clinical records of patients meeting inclusion and exclusion criteria were obtained retrospectively following the same protocol as Pun et al. [9]. We included patients aged 18 years and older treated in the intensive care unit for at least 24 hours, with or without mechanical ventilation requirements.

Records of patients who died or were transferred and those who required end-of-life care in the first 24 hours were excluded.

### Procedure

Data extraction was carried out between May and August 2020. The period between March 1st and August 31st, 2019 (six months) was analyzed retrospectively, considering "one day" from 00:00 to 23:59 hours. One researcher (FM-M) checked the electronic clinical records each day of stay in the unit to extract clinical, socio-demographic, and bundle-related variables, which were entered into an Excel spreadsheet on the researcher's computer. Patients who were still in the intensive care unit on August 31st were followed-up until they were transferred, died, or up to 30 days after that day.

Nursing, physiotherapy, and medical professionals could write clinical notes on a given day. The researcher extracting the data registered the number of times per day when bundle elements had been recorded, and therefore, it was possible that a clinical note could contribute to more than one bundle element. For example, if a nursing clinical note referred to having assessed pain (element A) and the level of agitation-sedation (element C), this was counted as two records (one for each element).

### Local context

In the participating site of this study, the ABCDEF bundle has not been implemented as part of the clinical and care processes. However, some elements were implemented according to the predecessor bundle (ABCDE) [20] through local protocols for early mobilization (implemented by physiotherapists in charge of providing neuromuscular and cardiorespiratory care with active collaboration in mechanical ventilation [21]), administration of sedation-analgesia (implemented by nurses and physicians) and weaning from mechanical ventilation (implemented by physiotherapists and physicians). The team consisted of one physician per 24-hour shift, three nurses, one physiotherapist, and three healthcare assistants per 12-hour shift, with a professional/patient ratio of 1:8, 1:3, 1:8, and 1:3, respectively. All procedures recorded by the professionals in the electronic clinical records were analyzed.

### Operational definitions of the ABCDEF bundle

The elements of the ABCDEF bundle were defined based on Pun et al. [9] protocol. We defined compliance with the ABCDEF

bundle as compliance with recording the elements of this bundle in the electronic clinical record. We did not determine full or partial compliance with the bundle, defining compliance as:

- Element A: recording of at least one pain assessment using a valid and reliable instrument (visual analog scale, numerical analog scale, Behavioral Pain Scale, or Critical Care Observation Tool).
- Element B was subdivided into:
  - B1 (Spontaneous Awakening Trials) is the recording of at least one sedation interruption trial.
  - B2 (Spontaneous Breathing Trials) is the recording of at least one spontaneous breathing trial.
- Element C: recording of at least one assessment of agitation-sedation using a valid and reliable instrument (i.e., Richmond Agitation Sedation Scale, Sedation Agitation Scale, or other).
- Element D: recording of at least one delirium assessment using a valid and reliable instrument (e.g., the Confusion Assessment Method for the ICU, the Intensive Care Delirium Screening Checklist, or other).
- Element E: recording of at least one early mobilization modality (e.g., passive bed mobility, active bed mobility, sitting at the edge of the bed, standing, walking, transferring to a chair, tilt-table, or neuro muscular electrostimulation).
- Element F: recording of at least one of the following activities performed with a family member/caregiver who has been educated or participated in rounds, lectures, care plans, or bundle-related care.

Eligibility criteria varied according to each element. All days were considered eligible for elements A, C, D, and F. For element B1, only days in which patients received continuous or intermittent sedation infusions were considered, while for element B2, only days in which patients received mechanical ventilation were considered. Only days with a physician's indication for early mobilization, documented in the electronic clinical record, were eligible for element E. For elements B1 and B2, the outcome of the trial was considered as success or failure, while for the latter, the type of trial used (e.g., T-tube or pressure support) was also identified.

### Statistical analysis

Clinical, socio-demographic, and bundle compliance-related continuous variables are presented as median and interquartile range, while categorical variables are presented as absolute and relative frequency. The unit of analysis was the patient/day, and bundle compliance was established as the percentage of the number of patient/day where the defined element was present divided by the total number of patient/day eligible. Because the eligibility criteria differ per bundle element, the number of eligible patient/day per element varies. Results are presented separately for patients receiving mechanical ventilation and

patients without mechanical ventilation patient/days. Data were analyzed using Microsoft Excel© 2018.

## RESULTS

During the recruitment period, 176 patients were admitted, of which 133 were included in the analysis (Figure 1). Of the 133 patients included (Table 1), 1134 patient/days were obtained, comprising 4165 bundle element records, of which 1944 (47%) were from nurses, 1851 (44%) from physiotherapy, and 297 (7%) from physicians (Table 2).

### Daily compliance with the ABCDEF bundle

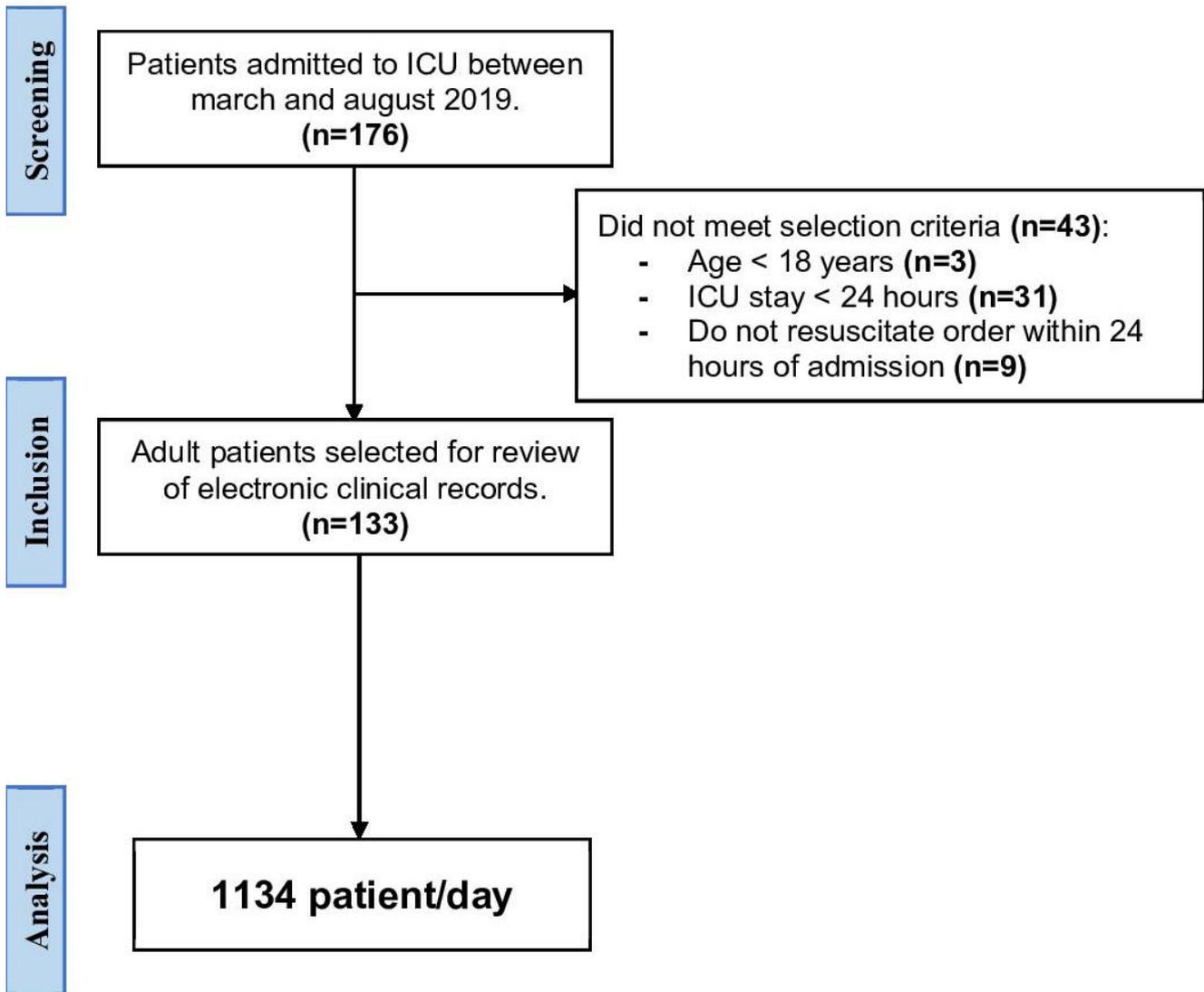
Daily compliance per bundle element was determined from the 4165 records obtained in the 1134 patient/days, presented comparatively in patient/days with and without mechanical ventilation (Table 3). For elements A, C, D, and F, compliance was 14, 41, 24 and 0%, respectively. For element B1, 51% of the patient/days were eligible, and 0% compliance was obtained, while for B2, 35% of the patient/days were eligible, and 11% compliance was obtained. Element E obtained a compliance rate of 67%, considering 79% of the patient/days eligible. Details regarding the information used to determine compliance for each bundle element are presented in Table 4.

## DISCUSSION

In this retrospective study, compliance with recording the ABCDEF bundle elements was heterogeneous. Early mobilization (E) and choice of sedation (C) were the most recorded, while spontaneous awakening trials (B1) and family engagement were the least recorded (F). Nurses and physiotherapists records were the main source of information on bundle compliance. The retrospective nature of our study provides a genuine approach by not modifying or preempting the recording behavior of the healthcare professionals.

This is the first retrospective study measuring the compliance with recording the bundle including the F element. Compliance with the bundle elements varies as reported in the literature between 7 and 92% [9–14]; five of the studies mentioned above correspond to surveys, two were directed only to physicians [11,12], another to nurses [10] and the other two were answered by an interdisciplinary team [13,14]. In contrast, our work is longitudinal and using an interdisciplinary approach to bundle compliance. The only prospective study to date is Pun et al. [9], which included more than 15 000 patients. Our study had a similar structure for data extraction, and, in general, we found lower compliance with recording. In our study, compliance with recording seems to be as expected for a unit that has not implemented the bundle into its care processes and only has experience with some of the elements through internal protocols. On the contrary, the Intensive Care Unit Liberation Collaborative provided expert support for a year and a half in more than 68 intensive care units [22,23], which could explain the better results they found.

Figure 1. Flow chart of selection of patient/days.



Source: Prepared by the authors based on the study results.

In Chile, the experience implementing the bundle is recent and limited. In 2019, recommendations for analgesia, sedation, and neuromuscular blockade in adult patients with critical illness were published [24]. Subsequently, a national multiprofessional survey was conducted with the aim of identifying the national practices of the health care team concerning this topic [15]. For this reason, only the results of elements B1 (31%), C (97%), and D (48%) can be compared at the local level. We found that compliance was less than half of what was reported in the national study for all three elements. This may be associated with a reporting bias where practitioners indicate the behavior they consider optimal, but this does not necessarily reflect what occurs in clinical practice. There is also the possibility that the professionals' reporting is in line with what they do in practice, but their recording in the clinical record is substandard.

There is a positive attitude among both family and healthcare professionals toward the inclusion of family members in the care of their loved ones in the intensive care unit. However, it is still unknown how this process should be structured and the potential outcomes for patients [25]. Therefore, the lack of administrative structure that promotes the inclusion of family members and/or the lack of recording could explain the 0% compliance in our study. This is consistent with the result of an international survey, where 77% of physicians in South America reported that they do not have a 24-hour open visitation policy for family members [11], similar to the 93% reported in Argentina [13]. Therefore, strategies involving family members should be developed to understand their impact on patient outcomes.

Although element E obtained higher compliance than the 29% reported by Pun et al. [9], only 14% of the physiotherapy

**Table 1.** Clinical and sociodemographic characteristics of patients admitted to the ICU (n = 133).

Variable	Total n (%) or P <sub>50</sub> (IQR) (n = 133)	IMV n (%) or P <sub>50</sub> (IQR) (n = 63)	Without IMV n (%) or P <sub>50</sub> (IQR) (n = 70)
APACHE II at ICU admission (n = 78) <sup>1</sup>	13 (9 to 18)	13 (10 to 22)	11 (7 to 15)
Age (years)	53 (39 to 67)	54 (41 to 64)	51 (35 to 71)
<b>Gender</b>			
Female	57 (43)	31 (49)	26 (37)
Male	76 (57)	32 (51)	44 (63)
Body mass index (n = 59) <sup>2</sup>	28 (26 to 39)	30 (25 to 39)	27 (23 to 29)
<b>Comorbidities</b>			
0	45 (34)	25 (40)	20 (29)
1	31 (23)	13 (21)	18 (26)
2	24 (18)	12 (19)	12 (17)
≥ 3	33 (25)	13 (21)	20 (29)ICUICU
ICU length of stay, days	5 (3 to 9)	9 (4 to 15)	3 (2 to 5)
Duration of IMV, days	3 (1 to 8)	3 (1 to 8)	N/A
Duration of sedation, days (n = 78)	4 (2 to 11)	6 (3 to 12)	2 (1 to 4)
<b>Type of sedation</b>			
Opioids	61 (78)	57 (93)	4 (23)
Benzodiazepines	58 (74)	44 (72)	14 (82)
Dexmedetomidine	50 (64)	43 (70)	7 (41)
Propofol	43 (55)	42 (69)	1 (6)
Antipsychotics	24 (31)	18 (29)	6 (35)
Ketamine	22 (28)	22 (36)	0 (0)
Neuromuscular blocking agents	24 (31)	24 (39)	N/A
<b>Previous unit</b>			
Emergency service	51 (38)	18 (29)	33 (47)
Transfer from another healthcare facility	48 (36)	23 (37)	25 (36)
Intermediate care unit	25 (19)	16 (25)	9 (13)
Ward	7 (5)	6 (10)	1 (1)
Other	2 (2)	0 (0)	2 (3)
<b>Pathology of admission</b>			
Cardiac	23 (17)	10 (16)	13 (19)
Respiratory	22 (16)	10 (16)	12 (17)
Neurological	21 (16)	8 (13)	13 (19)
Sepsis	19 (14)	13 (21)	6 (8)
Gastrointestinal	13 (10)	5 (8)	8 (11)
Polytrauma	10 (8)	7 (11)	3 (4)
Suicide attempt	8 (6)	2 (3)	6 (9)
Others	17 (13)	8 (13)	9 (13)
<b>Discharge destination</b>			
Transfer to intermediate care	94 (71)	47 (75)	47 (67)
Discharge from ICU	16 (12)	4 (6)	12 (17)
ICU mortality	8 (6)	8 (13)	0 (0)
Transfer to medical-surgical ward	8 (6)	4 (6)	4 (6)
Transfer to another center	6 (5)	0 (0)	6 (9)
Transfer to the maternity ward	1 (1)	0 (0)	1 (1)

APACHE II: Acute Physiology and Chronic Health disease Classification System II. IQR: Interquartile range. ICU: Intensive care unit. IMV: Invasive mechanical ventilation. N/A: Not applicable. P50: Median.

<sup>1</sup>APACHE II was obtained from 78 patients, of whom 49 were with IMV and 29 without IMV.

<sup>2</sup>Body mass index was obtained from 59 patients, of whom 35 were with IMV and 24 without IMV.

Corresponds to a medical/surgical ward and an admission from another ICU.

Benzodiazepines are considered both enteral and intravenous.

Type of sedation: percentages calculated considering the 78 patients who received sedative drugs.

78 patients received sedation, of whom 61 received IMV, and 17 did not receive IMV.

Source: Prepared by the authors based on data extracted from electronic clinical records.

modalities recorded were in patient/days with mechanical ventilation, with bed mobility records predominating and only in one patient/day walking was recorded (Table 4). Our results are consistent with what has been described in the literature since patients in the intensive care unit spend more than 90%

of their time inactive [26–29]. Similar is the case for element D, which obtained 24% compliance. Currently, there is a large difference in the incidence of delirium reported in the literature. Ten percent of the recorded assessments were reported as positive for the Confusion Assessment Method for the ICU

**Table 2.** Compliance by ABCDEF bundle element according to the electronic clinical record of the professionals (n = 4165).

Element	Profession, n (%)				
	Physician	Nursing	Physiotherapy	Occupational therapy	Other <sup>1</sup>
Total number of records	297 (7)	1944 (47)	1851 (44)	57 (1)	16 (0)
Element A	9 (3)	186 (10)	17 (1)	0 (0)	3 (19)
Element B1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Element B2	0 (0)	0 (0)	41 (2)	0 (0)	0 (0)
Element C	284 (96)	1758 (90)	771 (42)	0 (0)	13 (81)
Element D	4 (1)	1 (0)	329 (18)	0 (0)	0 (0)
Element E	0 (0)	0 (0)	692 (37)	57 (100)	0 (0)
Element F	0 (0)	0 (0)	1 (0)	0 (0)	0 (0)

<sup>1</sup>Includes trauma, neurology, neurosurgery, anesthesiology, and pharmacist records.

Source: Prepared by the authors based on data extracted from electronic clinical records.

**Table 3.** Compliance per element of the ABCDEF bundle for six months during 2019.

Element	Total	IMV	Without IMV
	n (%) or P <sub>50</sub> (IQR) (n = 1134)	n (%) or P <sub>50</sub> (IQR) (n = 391)	n (%) or P <sub>50</sub> (IQR) (n = 743)
<b>Element A</b>			
Eligible	1134 (100)	391 (35)	743 (65)
Compliance	158 (14)	15 (4)	143 (19)
≥ 6 evaluations per day	1 (0)	0 (0)	1 (0)
Number of evaluations per day	1 (1 to 1)	1 (1 to 1)	1 (1 to 1)
<b>Element B</b>			
Eligible B1 element	574 (51)	362 (63)	212 (37)
Compliance	0 (0)	0 (0)	0 (0)
Eligible Element B2	391 (35)	391 (100)	N/A
Compliance	41 (11)	41 (11)	N/A
<b>Element C</b>			
Eligible	1134 (100)	391 (100)	743 (100)
Compliance	466 (41)	358 (92)	109 (15)
≥ 6 evaluations per day	202 (43)	194 (54)	8 (7)
Number of evaluations per day	5 (2 to 7)	6 (4 to 7)	7 (6 to 8)
<b>Element D</b>			
Eligible	1134 (100)	391 (100)	743 (100)
Compliance	274 (24)	90 (23)	184 (25)
≥ 2 evaluations per day	42 (15)	12 (13)	30 (16)
Number of evaluations per day	1 (1 to 1)	1 (1 to 2)	1 (1 to 1)
<b>Element E</b>			
Eligible	897 (79)	306 (78)	591 (80)
Compliance	600 (67)	149 (49)	451 (76)
Number of early mobilization sessions <sup>1</sup>	749 (100)	178 (24)	571 (76)
Number of early mobilization sessions per day	1 (1 to 1)	1 (1 to 1)	1 (1 to 1)
<b>Element F</b>			
Eligible	1134 (100)	391 (100)	743 (100)
Compliance	1 (0)	1 (0)	0 (0)

IMV: Invasive mechanical ventilation; IQR: Interquartile range. N/A: not applicable. P50: Median.

<sup>1</sup>One patient/day could contain more than one early mobilization record; the total number of sessions recorded in the 600 patient/days was n = 749.

Source: Prepared by the authors from data extracted from electronic clinical records.

(CAM-ICU), with this incidence being 12.3% in patient/days on invasive mechanical ventilation (Table 4). However, the reported incidence is 87%, and delirium in patients with critical illness is associated with increased mortality [30]. A late evaluation could explain the underestimation of delirium since 66.2% of the records were made in patient/days who did not receive mechanical ventilation (Table 4), which decreases the chances of detecting the condition when patients were ventilated and could have developed the condition [31].

This study has several limitations that should be mentioned. First, the size and direction of the reporting bias associated with the use of electronic clinical records to determine bundle compliance is unclear. Second, the findings are not generalizable as they represent the reality of a single center. Nevertheless, we believe that the methodology used can be replicated in other centers to determine baseline bundle compliance and establish quantifiable goals to improve implementation. Third, since we did not have a standardized database according to

**Table 4.** Bundle elements recorded by practitioners across the 1134 patient/days (n = 4165).

Element	Total n (%) or P <sub>50</sub> (IQR) (n = 1134)	IMV n (%) or P <sub>50</sub> (IQR) (n = 391)	Without IMV n (%) or P <sub>50</sub> (IQR) (n = 743)
<b>Element A</b>			
Assessment instrument reported	215 (100)	17 (8)	198 (92)
VAS	209 (97)	17 (100)	192 (97)
NAS	6 (3)	0 (0)	6 (3)
BPS	0 (0)	0 (0)	0 (0)
CPOT	0 (0)	0 (0)	0 (0)
Scores of the assessment instruments reported			
VAS	0 (0 a 4)	0 (0 a 3)	0 (0 a 4)
NAS	4 (3 a 6)	N/A	4 (3 a 6)
BPS	N/A	N/A	N/A
CPOT	N/A	N/A	N/A
Significant pain reported			
Yes <sup>1</sup>	75 (35)	4 (24)	71 (36)
No	140 (65)	13 (76)	127 (64)
<b>Element B</b>			
SBT reported	41 (100)	41 (100)	0 (0)
Pressure support SBT	21 (51)	21 (51)	0 (0)
T-tube SBT	13 (32)	13 (32)	0 (0)
SBT not reported	7 (17)	7 (17)	0 (0)
SBT outcome reported			
Success	4 (10)	4 (10)	0 (0)
Failure	1 (2)	1 (2)	0 (0)
Outcome not reported	36 (88)	36 (88)	0 (0)
<b>Element C</b>			
Assessment instrument reported	2826 (100)	2283 (81)	543 (19)
RASS	2200 (78)	1948 (85)	252 (46)
SAS	78 (3)	61 (3)	17 (3)
GCS	307 (11)	117 (5)	190 (35)
FOUR	241 (8)	157 (7)	84 (16)
Scores of the assessment instruments reported			
RASS	-2 (-4 a 0)	-2 (-4 a -1)	0 (-1 a 1)
SAS	2 (1 a 4)	2 (1 a 3)	4 (3 a 5)
GCS	15 (12 a 15)	11 (9 a 15)	16 (15 a 16)
FOUR	15 (11 a 16)	12 (9 a 16)	14 (14 a 15)
<b>Element D</b>			
Assessment instrument reported	334 (100)	113 (34)	221 (66)
CAM-ICU	334 (100)	113 (100)	221 (100)
ICDSC	0 (0)	0 (0)	0 (0)
Results of the assessment instruments reported			
Positive	32 (10)	14 (12)	18 (8)
Negative	240 (72)	55 (49)	185 (84)
Not assessable	62 (18)	44 (39)	18 (8)
<b>Element E</b>			
Early mobilization modality reported	1451 (100)	203 (14)	1248 (86)
Passive bed mobility	228 (16)	114 (50)	114 (50)
Active bed mobility	326 (22)	54 (17)	272 (83)
Sitting on the edge of the bed	277 (19)	15 (5)	262 (95)
Standing on spot	277 (19)	11 (4)	266 (96)
Walking	140 (10)	1 (1)	139 (99)
Transfer to a chair	197 (14)	8 (4)	189 (96)
NMES	2 (0)	0 (0)	2 (0)
Tilt Table	4 (0)	0 (0)	4 (0)

BPS: Behavioral Pain Scale; CAM-ICU: Confusion Assessment Method for the ICU. CPOT: Critical Care Pain Observation Tool. FOUR: Full Outline of UnResponsiveness. GCS: Glasgow Coma Scale. ICDSC: Intensive Care Delirium Screening Checklist. IQR: Interquartile range. IMV: Invasive mechanical ventilation. N/A: Not applicable. NAS: Numerical Analog Scale. P50: Median. RASS: Richmond Agitation Sedation Scale. SAS: Sedation Agitation Scale. SBT: Spontaneous Breathing Trial. VAS: Visual Analog Scale. NMES: Neuromuscular electrical stimulation.

<sup>1</sup>BPS greater than 5, CPOT greater than 3, and VAS and NAS greater than 3.

Notes: This table does not present the elements that presented 0% compliance (B1 and F). One patient/day may contain more than one evaluation per element; for this reason, the percentages are adjusted to 100% of those recorded in each element.

Source: Prepared by the authors based on data extracted from electronic clinical records.

the bundle criteria, we excluded records that were not explicit in recording compliance with the bundle elements in order to maintain rigor in data extraction. This procedure was performed only by the principal investigator (FM-M).

Future research should consider the professional roles of intensive care unit teams implementing the bundle to explore its relationship with compliance and patient outcomes, as in the ongoing randomized clinical trial by Sosnowski et al. [32]. In addition, future studies should analyze bundle compliance and its impact on patients, considering centers that do not perform sedation interruption trials and have light sedation protocols. As in elements A, C, and D, the rest of the elements should define compliance according to the use of measurement instruments, such as peripheral muscle strength or mobility in element E [33]. Finally, to improve knowledge translation, human behavioral assessment models, such as the behavioral model of capability, opportunity, and motivation [34] would help explore the potential reasons clinicians do or do not implement the bundle using mixed-methods research.

## CONCLUSIONS

Based on the electronic clinical records, elements E and C were identified as having a higher compliance with recording, followed by elements D, A, and B2. No recording of compliance with elements B1 and F was identified. Nursing and physiotherapy staff contributed the most to recording compliance with the bundle. The results of this study establish a baseline for improvements in the implementation of the bundle in intensive care units where it has not been implemented as standard of care.

**Contributor roles** FMM: conceptualization, methodology, research, data curation, preparation of the original manuscript, review and editing of the article, visualization, and project management. JL: conceptualization, methodology, research, data curation, preparation of the original manuscript, review and editing of the article, visualization, and project management. FGS: data curation, preparation of the original manuscript, review, and editing of the article. ACA: conceptualization, methodology, research, data curation, preparation of the original manuscript, review and editing of the article, visualization, and project management. All authors agree to be responsible for all aspects of the work and to resolve questions related to the work with accuracy or completeness.

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# Cumplimiento diario del *bundle* ABCDEF de liberación de los pacientes de cuidados intensivos: estudio descriptivo retrospectivo

## RESUMEN

**INTRODUCCIÓN** La implementación del *bundle* ABCDEF ha demostrado mejores resultados en los pacientes críticos. El objetivo de este trabajo es identificar el cumplimiento del registro diario del *bundle* ABCDEF en una unidad de cuidados intensivos chilena.

**MÉTODOS** Estudio observacional retrospectivo de los registros clínicos electrónicos de profesionales de enfermería, kinesiología y medicina que trataron a pacientes mayores de 18 años, hospitalizados en una unidad de cuidados intensivos durante al menos 24 horas, con o sin requerimiento de ventilación mecánica. Se determinó el cumplimiento diario del *bundle* considerando la presencia del registro en la ficha clínica de cada elemento: evaluación del dolor (elemento A), prueba de interrupción de la sedación (elemento B1) y ventilación espontánea (elemento B2), elección de la sedación (elemento C), evaluación del *delirium* (elemento D), movilización temprana (elemento E) y empoderamiento de la familia (elemento F).

**RESULTADOS** Se obtuvieron 4165 elementos del *bundle* registrados provenientes de enfermería (47%), kinesiología (44%) y medicina (7%), incluyendo 1134 días/paciente (133 pacientes). Los elementos E y C mostraron un cumplimiento del 67 y 40%, mientras que D, A, y B2 mostraron 24, 14 y 11%, respectivamente. Para B1 y F se obtuvo 0% de cumplimiento. El cumplimiento fue mayor en los pacientes sin ventilación mecánica para A y E, mientras que para D fue similar.

**CONCLUSIONES** La movilización temprana fue el elemento con mayor cumplimiento, mientras que las pruebas de interrupción de sedación y el empoderamiento de la familia tuvieron incumplimiento absoluto. Futuros estudios deberían explorar las razones que expliquen los diferentes grados de cumplimiento por elemento del *bundle* en la práctica clínica.



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