

Worldwide ABCDEF (Assessing Pain, Both Spontaneous Awakening and Breathing Trials, Choice of Drugs, Delirium monitoring/management, Early exercise/mobility, and Family Empowerment) Survey

1. Alessandro Morandi, MD, MPH*

Ancelle Hospital, Department of Rehabilitation, Cremona, Italy
Geriatric Research Group, Brescia, Italy

2. Simone Piva, MD*

Department of Anesthesia, Critical Care and Emergency, Spedali Civili University Hospital, Brescia, Italy

3. E. Wesley Ely, MD, MPH

Professor of Medicine

Division of Pulmonary and Critical Care and Health Services Research

Vanderbilt University and VA Geriatric Research Education Clinical Center (GRECC), Nashville, TN, USA

4. Sheila Nainan Myatra MD, FCCM, FICCM

Professor of Critical Care Medicine

Department of Anaesthesiology, Critical Care and Pain.

Tata Memorial Hospital, Mumbai, India

5. Jorge I.F. Salluh, MD, PhD

Senior Researcher

Department of Critical Care Doctor Institute for Research and Education and Post-Graduate Program Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

6. Dawit Amare, MD

Addis Hiwot General Hospital

Head of internal medicine and ICU Physician

Addis Ababa Ethiopia

7. Elie Azoulay, MD, PhD

Medical Intensive Care Unit, Hôpital Saint-Louis,

ECSTRA team, Biostatistics and clinical epidemiology, UMR 1153 (Center of Epidemiology

and Biostatistics Sorbonne Paris Cité, CRESS), INSERM, Paris Diderot Sorbonne

University.

8. Giuseppe Bellelli, MD

Associate Professor. School of Medicine and Surgery, University of Milano-Bicocca, Milano

Geriatric Clinic, San Gerardo University Hospital, Monza. Geriatric Research Group,

Brescia, Italy.

9. Akos Cosmos, MD
Chief, Department of Anaesthesia and Intensive Care, Medical Centre, Hungarian Defence Force. President Hungarian Society of Anaesthesiology and Intensive Therapy (MAITT). Budapest, Hungary

10. Eddy Fan, MD, PhD
Interdepartmental Division of Critical Care Medicine and Institute of Health Policy, Management and Evaluation, University of Toronto; and University Health Network, Toronto, Canada

11. Nazzareno Fagoni, MD
Department of Anesthesia, Critical Care and Emergency, Spedali Civili University Hospital, Brescia, Italy

12. Timothy D Girard, MD, MSCI
Associate Professor of Critical Care Medicine
CRISMA Center, Department of Critical Care Medicine; University of Pittsburgh and UPMC Health System

13. Gabriel Heras La Calle, MD
International Research Project Humanizing Intensive Care (Proyecto HU-CI) Intensive Care Unit. Hospital Universitario de Torrejón, Madrid. Spain

14. Shigeaki Inoue, MD, Ph.D, MSCI
Associate Professor & Chief Director
Dept. of Emergency and Critical Care Medicine, Tokai University, School of Medicine. Kanagawa, JAPAN

15. Chae-Man Lim, MD, PhD, FCCM
Professor of Medicine
Department of Pulmonary and Critical Care Medicine Asan Medical Center, Univ. of Ulsan College of Medicine
88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea

16. Rafael Kaps, MD
Specialist of internal medicine and specialist of intensive care medicine
Head of Dept.
General Hospital Novo mesto, 8000 Novo mesto, Slovenia

17. Katarzyna Kotfis, M.D., Ph.D. Department of Anaesthesia, Intensive Care and Acute Poisoning, Pomeranian Medical University, Szczecin, Poland

18. Younsuck Koh, MD, Professor of Medicine
Professor of Medical Humanities and Social Sciences Department of Pulmonary and Critical Care Medicine Asan Medical Center, Univ. of Ulsan College of Medicine, 88 Olympic-ro 43-gil, Songpa-gu, Seoul 05505, Korea

19. David Misango, MD
Assistant Professor of Anaesthesiology
Aga Khan University Hospital, Nairobi.

20. Pratik Pandharipande, MD, MSCI
Professor of Anesthesiology and Surgery
Department of Anesthesiology, Division of Anesthesiology Critical Care Medicine
Vanderbilt University Medical Center, Nashville, TN, USA
21. Chairat Permpikul,
Associate Professor. Siriraj Hospital, Bangkok, Thailand
22. Cheng Cheng Tan, Dong-Xin Wang, MD, PhD
Department of Anesthesiology and Critical Care Medicine
Peking University First Hospital
Beijing 100034, China
23. Tarek Sharshar, MD, PhD
Senior Consultant, Department of Intensive Care Medicine Raymond Poincaré Hospital,
Paris, France
24. Yahya Shehabi, PhD, FCICM, FANZCA, EMBA
Professor of Intensive Care Medicine
School of Clinical Sciences, Faculty of Medicine Monash University & Medical Center,
Melbourne, Australia; University New South Wales, Clinical School of Medicine, NSW 2031
25. Yoanna Skrobik MD FRCP(c) MSc. FCCM
Department of Medicine, McGill University, Montreal, Canada
26. Jeffrey M Singh, MD
Interdepartmental Division of Critical Care Medicine, University of Toronto; and Krembil
Neuroscience Centre, University Health Network, Toronto, Canada
27. Arjen Slooter, MD, PhD
Professor of Intensive Care Neuropsychiatry and Consultant Neurologist – Intensivist
Department of Intensive Care Medicine; Brain Center Rudolf Magnus, Utrecht University;
University Medical Center Utrecht, The Netherlands
28. Martin Smith MBBS FRCA FFICM
Department of Neurocritical Care
University College London Hospitals
UCL National Institute for Health Research Biomedical Research Centre
London UK
29. Ryosuke Tsuruta, MD, PhD
Acute & General Medicine; Yamaguchi Graduate School of Medicine
Yamaguchi, JAPAN
30. Nicola Latronico, MD
Professor of Anesthesia and Critical Care Medicine
Department of Surgical Specialties, Radiological Sciences and Public Health, University of
Brescia, Brescia, Italy

Department of Anesthesia, Critical Care and Emergency, Spedali Civili University
Hospital, Brescia, Italy

*Dr Morandi and Dr Piva have equally contributed as first authors to the manuscript.

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All correspondence and reprint requests should be sent to:

Alessandro Morandi MD, MPH

Via Aselli 16; Cremona, 26100

Email: morandi.alessandro@gmail.com

ABSTRACT

Objective: To assess the knowledge and use of the ABCDEF bundle to implement the Pain, Agitation, Delirium (PAD) guidelines.

Design: Worldwide On-line Survey.

Setting: Intensive care.

Intervention: A cross-sectional online survey using the Delphi method was administered to intensivists worldwide, to assess the knowledge and use of all aspects of the ABCDEF bundle (Assessment, prevention and management of pain; spontaneous awakening and Breathing trials; Choice of analgesia and sedation; Delirium assessment; Early mobility and exercise and Family engagement and empowerment.)

Measurement and Main Results: There were 1521 respondents from 47 countries, 57% had implemented the ABCDEF bundle, with varying degrees of compliance across continents. Most of the respondents (83%) used a scale to evaluate pain. SATs and SBTs are performed in 66% and 67% of the responder ICUs respectively. Sedation scale was used in 89% of ICUs. Delirium monitoring was implemented in 70% of ICUs, but only 42% used a validated delirium tool. Likewise, early mobilization was “prescribed” by most but 69% had no mobility team and 79% used no formal mobility scale. Only 36% of the respondents assessed ICU acquired weakness. Family members were actively involved in 67% of ICUs, however only 33% used dedicated staff to support families and only 35% reported that their unit was open 24 hours/day for family visits.

Conclusions: The current implementation of the ABCDEF bundle varies across individual components and regions. We identified specific targets for quality improvement and adoption of the ABCDEF bundle. Our data reflect a significant but incomplete shift towards patient- and family-centered ICU care in accordance with the PAD guidelines.

INTRODUCTION

Survivors of critical illness often experience persistent physical, mental, and cognitive impairment.(1-5) Inadequately treated pain, excessive sedation, delirium and reduced mobilization have emerged as risk factors for acute muscle wasting and weakness, persisting physical dysfunction and cognitive decline. To aid adoption of the SCCM's Pain, Agitation, Delirium (PAD) guidelines, an evidence-based multicomponent and interprofessional team management strategy, known as ABCDEF bundle (Assess, prevent, and manage pain; Both Spontaneous Awakening Trials (SATs) and Spontaneous Breathing Trials (SBTs); attention to the Choice of analgesia and sedation; Delirium monitoring and management; Early mobility and exercise; and Family engagement and empowerment) has been developed and implemented in thousands of ICUs.(6-9) Each component of the ABCDEF bundle addresses a target practice in the ICU independently associated with patient safety or patient-centered outcomes. (10-26) For example, multiple studies have demonstrated the efficacy of implementing combined SATs and SBTs to shorten duration of mechanical ventilation and ICU length of stay.(10-13) To date, the ABCDEF bundle approach has been evaluated in only a few countries and some reports are available on the individual components.(27-33) Results vary widely across different countries and jurisdictions.(34)

Evaluation of the current state of understanding and implementation of the ABCDEF bundle would help future knowledge translation efforts and identify targets for quality improvement initiatives. We thus employed an international, web-based survey to assess (1) knowledge of the ABCDEF bundle and (2) differences in the use of each component across the world.

METHODS

We conducted a worldwide survey of intensivists (i.e., physicians) endorsed by the European Society of Intensive Care Medicine (ESICM). The survey instrument described the ABCDEF bundle and then probed eight domains with a total of 41 questions (Supplemental Digital Content 1). Sixty-eight questions were initially created by A.M. and S.P. and were then reduced to 41 using a Dephi method by a steering committee (SC), who were asked to rate each question on a Likert Scale ranging from “retain” to “exclude.” The survey was then pretested by the SC, who provided written feedback on *Face validity*, *Content Validity* and *Criterion Validity*. Lastly, the instrument was *pilot tested* by the SC, evaluating duration, flow, relevance and acceptability, and questions were screened for redundancy, relevance and clarity. *Clinical sensitivity testing* was completed by the steering committee using a 7-question instrument (Supplemental Digital Content 2: Appendix 1), and *Test-Retest Reliability* was assessed by the SC who repeated duplicate surveys within 4 weeks.

Survey administration

The survey and a cover letter were distributed to members of ESICM and other national and regional intensive care societies between March 1st and September 15th 2016 via Lime Survey (LimeSurvey GmbH, Hamburg, Germany). To expand survey distribution and improve response rate, SC members sent reminder emails with a cover letter, and a web-based advertisement was sent to the following societies: ESICM, the Italian Society of Anesthesia, Analgesia, Reanimation and Intensive Care (SIAARTI), the Indian Society of Critical Care Medicine, the Japanese Society of Critical Care Medicine, and the Australasian and New Zealand Intensive Care Society.

The survey was open and anonymous, and the database was securely maintained at the University of Brescia (www.anestbs.com). Question sequence was randomized to avoid bias. Date, total time and single item time of compilation were recorded. The computer IP

address of the respondent was recorded to avoid duplicate entries. The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) checklist was used to report the data.(35)

Data analysis

Only complete questionnaires were included in the final analysis. Aggregated responses are reported as frequencies and percentages. Continuous data are reported as mean (SD). For test-retest analysis, Chi-square test for nominal data, Spearman rho for ordinal data and Pearson r for interval data were used. Analyses were performed with Stata 13.0 (STATA Corp, College Station, USA) software.

RESULTS

We received 1,521 completed questionnaires from respondents in Europe (N=607), South America (N=265), Asia (N= 441), North America (N= 120), Oceania (N=45), and Africa (N= 43). The most represented countries were Italy (N=371, 24%), followed by India (N=250, 16%) and Brazil (N=159, 10%) (Supplemental Digital Content 2: Appendix 2, Figure 1 and Appendix 3). The characteristics of the respondents are listed in Table 1. Just over half of respondents reported implementing the pain, agitation and delirium (PAD) guidelines (56.2%) and the ABCDEF bundle (56.6%). Overall, the ABCDEF bundle implementation was greater in non academic hospitals, in open/semiopen ICUs, and in ICU with larger yearly admissions (Supplemental Digital Content 2: Appendix 6).

(A) Assess, prevent, and manage pain

Though responses varied geographically, most respondents (83%) reported using a scale to evaluate pain (Table 2 and Supplemental Digital Content 2: Appendix 4, Figure 2). The pain scale reported to be most widely used were the visual analogic scale (VAS) (54%) and the numerical rating scale (NRS) (54%). Only 56% of the respondents reported using preemptive analgesia before nursing procedures. The preferred analgesics were morphine (78%), fentanyl (79%) and paracetamol (69%) alone or in combination.

(B) Both SAT and SBT

Two-thirds or respondents reported performed SATs, most often once daily (59%) but with wide geographic variation (Table 2 and Supplemental Digital Content 2: Appendix 4, Figure 2). Similarly, 67% of respondents reported using SBTs. Only 42% of respondents reported using a coordinated protocol synchronizing SAT and SBT (i.e., a “wake up and breathe” protocol), most often performed by physicians (27%) or nurses (15%).

(C) Choice of analgesia and sedation

Respondents (61%) most often reported using the Richmond Agitation Sedation Scale (RASS) to evaluate the level of arousal, followed by the Ramsey scale (22%) (Table 2 and Supplemental Digital Content 2: Appendix 4, Figure 2). Just over one-third of respondents reported using a sedation protocol. The sedation protocols reported typically (90%) focus on using minimal or no sedation with avoidance of benzodiazepines. When treating an agitated patient, most respondents reported they evaluate pain first, and then delirium before considering using sedation.

(D) Delirium

Half of the respondents estimate that 30% or less of patients in their ICU have delirium (Table 3 and Supplemental Digital Content 2: Appendix 4, Figure 2). One-third of respondents do not routinely monitor delirium, whereas 40% report they assess patients for delirium once a day, and 30% report doing so more than once a day, with substantial variation across continents. More than half (58%) of the respondents do not use specific tools to monitor delirium, though they acknowledge the need for delirium monitoring. Among those who use a tool, CAM-ICU is preferred (83%) followed by the ICDSC (17%).

When delirium is identified, 74% of respondents would investigate potential causes, but significant heterogeneity was reported in the sequence of diagnostic methods used; the preferred combination was neurological examination followed by a review of medications, laboratory tests and infection screening. Respondents reported rarely using neuroimaging, electroencephalography, and evoked potentials to investigate delirium. Just under half of respondents believe that delirium could affect mortality, ICU and hospital length of stay, ICU cost, family burden or cognitive impairment.

Among nonpharmacological interventions to promote sleep, respondents most commonly (28%) prefer optimizing ambient light, timing of drug administration, and noise.

Alternatively, 58% of respondents reported prescribing drugs to promote sleep, with benzodiazepine alone (11%) being the preferred agent (data not shown).

When managing delirium, 58% of respondents reported they do not use a protocol, and 65% reporting using haloperidol, most often (44%) as a single dose. Atypical antipsychotics are used by 53% respondents, either as a first approach (39%) or when haloperidol is not effective (42%). Respondents report consulting a specialist in 64% of delirium cases, usually (63%) in the most challenging cases.

(E) Early Mobilization and Exercise

Just over one-third of respondents reported they routinely assess patients for intensive care unit acquired weakness (ICUAW), most often using the Medical Research Council (MRC) scale (49%) or an electrophysiological evaluation (41%) (Table 4 and Supplemental Digital Content 2: Appendix 4, Figure 2). From 73% to 91% of respondents, depending on the continent, report prescribing early mobilization, though they report rarely using a specific mobility scale (21%). Approaches reported consisted of combined passive range of motion (PROM), active physiotherapy, and ambulation (32%). Cycle ergometry (14%) and neuromuscular electrical stimulation (6%) were infrequently reported. One-third (31%) reported having a mobility team, consisting of a physical therapist (33%) or physical therapist and ICU nurses (17%) or physical therapist, respiratory therapist and ICU nurses (12%) (Supplemental Digital Content 2: Appendix 4, Figure 2). Interestingly 35% of the respondents who reported to use early mobilization does not use any specific scales to evaluate delirium.

(F) Family

Of the respondents, 65% report that their unit is not open 24 hours per day for family visitation, 74% report that family member visits are allowed <5 hours/day (Table 5;

Supplemental Digital Content 2, Appendix 4, Figure 2). Eighty-one percent of respondents report they explain delirium to family members, with 13% reporting they use booklets. Family members are actively involved in 67% of the cases but only 33% of the ICUs use dedicated staff to support families. When family members are actively involved there is a higher prevalence of interventions to reduce and treat delirium (Supplemental Digital Content 2: Appendix 7).

DISCUSSION

This is the first worldwide survey to assess the knowledge and use of the ABCDEF bundle. Of 1,521 respondents in 47 countries, 57% reporting implementing the bundle. The large majority (83%, 89% and 70%) reported evaluating pain, sedation and delirium in their ICU, though only 42% reporting using a validated delirium tool. Almost two-thirds reported using SATs and SBTs. Most report prescribing early mobility, but few report having designated mobility teams. Though family members were reported to be actively involved in most ICUs, few had dedicated staff to help family or incorporate family in decision making.

Though previous surveys and point prevalence studies have evaluated the use of the ABCDEF approach in the management of critically ill patients,(6-8) our investigation is the first international survey to assess use of the full ACBDEF bundle rather than focus on single components.(27-33) A multicenter European survey found that 80% of ICUs reported routinely monitoring pain, with 93% using a validated tool for pain assessment.(27) The most frequently used pain score was the VAS (63%) followed by the NRS (57%). Alternatively, an Australian point prevalence study found pain was assessed only in 46% of 569 patients in 41 ICUs.(28) We found similar reported rates in Europe although we observed higher rates of pain monitoring in Oceania compared to the previous Australasian study, though this might be related to an over-estimation of the actual assessment.(28)

Our finding that 84% of respondents in Asia report using SATs and SBTs is consistent with data from a recent survey from India.(29) Our findings regarding use of SATs and SBTs in Europe (47% and 50%) are also consistent with previously reported data.(27)

Our responses from intensivists in Asia, Australia and Europe are comparable to those in previous surveys assessing use of sedation scales.(27-29) In an Australian point prevalence study, routine sedation scale use was recorded in 63% of invasively ventilated patients.(28) In a European Survey, routine sedation monitoring was reported in 88% of the

ICUs, with most reporting use of RASS (54%), Ramsay (27%), or SAS (6%).(27)

In a survey of Indian ICUs, 58% of respondents reported routinely monitoring sedation level, with the Ramsay being most often used (56%) followed by RASS (19%). Nearly all (95%) respondents reported using midazolam for sedation, followed by propofol (68%), and dexmedetomidine (60%); fentanyl was the most common analgesic agent used (47 %).(29) In our study, 35% of respondents reported they do not use sedation protocols, especially those in Africa, Europe and Oceania.

A survey conducted by the Indian Society of Critical Care Medicine found that 35% of intensivists reported assessing for delirium, using validated scales in only 22% of the cases (most commonly the CAM-ICU).(29) Similarly, a multicenter European Survey found that only 56% of respondents reported screening patients for symptoms of delirium.(27) In an Australian point prevalence study, routine assessment of delirium occurred in only 3% of patients.(28) In our study, delirium evaluation was reported to be much higher than in previous reports in Asia (81%) and in Australia (69%),(27-29) which could reflect overestimation on the part of respondents but might also reflect a change in clinical practice. CAM-ICU was reported to be the most widely used delirium monitoring tool, though 58% of respondents reported they do not use a tool, particularly those in Africa (86%), Oceania (36%) and South America (21%).

Though its efficacy remains in question (36), haloperidol is used to treat delirium and/or minimize the use of sedatives. Respondents to a European survey reported antipsychotics were the most frequently used agents for delirium treatment although it was not clear if this choice was related to treatment of psychotic symptoms or agitation.(27)

Two point prevalence studies across 116 German hospitals reported that only 8% of ventilated patients received out-of-bed mobility, and only 3% of patients in 38 Australian/New Zealand ICUs achieved sitting at the edge of the bed with none standing,

transferring to chair or walking.(30, 31) A recent point-prevalence study across 42 United States ICUs reported 32% of adult patients with acute respiratory failure (and 26% of ventilated patients) received physical/occupational therapy.(32) An Indian survey reported higher mobilization levels (86% at the bed side, 70% to a wheel chair and 67% limited ambulation).(29) Our results suggest a discordance in intent and resources for mobilization. Although 91% of respondents report prescribing early mobilization, only 36% say they evaluate for ICU-AW and 31% report having a dedicated mobility team. Additionally, there is significant variability in the composition of ICU mobility teams, with only a minority including a physical therapist, occupational therapist, nurses and physicians.

Despite broad consensus that liberalization of visiting hours in the ICU improves the care and experience of patients and families (37, 38), a recent multicenter Brazilian survey reported only 3% of the ICUs had liberal visitation policies.(39) Among 289 French ICUs, only 24% were open for family visits 24 hours per day.(40) Similarly, most of our respondents (65%) reported their units are not open 24 hours per day, with most ICUs (74%) open from 5 hours per day or less. Despite evidence of the benefit of family engagement, it remains unclear how family involvement should be structured.(41)

Our study has strengths and limitations. This is the first worldwide survey to explore the knowledge of the ABCDEF bundle and its use in clinical practice. The study included detailed questions about each component of ABCDEF, providing detailed information for future research. The precise response rate cannot be precisely determined due to the difficulties in conducting such a wide spread web-based survey, and there is a potential for selection bias due to the method of survey distribution. However, our survey respondents covered a broad range of age groups, clinical experience and types of ICUs, including both teaching and non-teaching hospitals of various sizes. Consequently, our data reflects the broad spectrum of clinical practice across regions and estimates the range of current clinical

practice. Additionally, our results suggest which elements of the bundle are the least implemented, thus providing targets for quality improvement initiatives, as well as those which need better infrastructural support for implementation. Another limitation might be related to a higher number of responses collected from single countries (e.g. Ethiopia for Africa, India for Asia, and Italy for Europe), potentially reflecting the care practices in those specific countries. Future studies should also evaluate responses at ICU level to further characterize the system organization and not just the single physicians.

CONCLUSIONS

Just over decade ago the majority of ICUs were closed to family members, practicing heavy sedation and patient immobilization. Our data reflect a dramatic yet incomplete cultural shift towards a patient- and family-centered ICU liberation strategy. There remains a compelling need for greater implementation of the ABCDEF bundle, particularly concerning the management of sedation, full appreciation and assessment of delirium and application of early mobility. An open ICU visitation policy is still rare, and there is a growing need to improve interaction with family members.

Author contribution:

Study conception and design – All authors. Acquisition of data – Morandi, Piva.

Interpretation of results – All authors. Drafted manuscript – Morandi, Piva. Critically revised the manuscript – All authors. Morandi and Piva have equally contributed as first authors to the manuscript.

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Conflict of interests:

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Dr. A.J.C. Slooter works on the development of an EEG-based delirium monitor, any (future) profits of this technology will be used for future scientific research only.

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Table 1**Characteristics of 1521 respondents in 47 Countries**

Variables	n (%)	Variables	n (%)
Age		ICU no. of beds	
25–35	314 (21)	0–10	481 (32)
36–45	585 (38)	10–20	642 (42)
46–55	368 (24)	> 20	398 (26)
56–65	223 (15)	Patients admitted per yr	
> 65	20 (2)	301–500	442 (34)
Years of clinical experience		501–1,000	431 (33)
5–10	399 (32)	> 1,000	353 (27)
11–20	476 (40)	Not available	78 (6)
> 20	365 (29)	Ventilated patients ^a (%)	
Specialty		51–70	567 (37)
Anesthesiology	603 (40)	≤ 50	579 (38)
Critical care	488 (32)	> 70	346 (23)
Internal medicine	190 (13)	Not available	29 (2)
Pulmonary medicine	115 (8)	ICU length of stay (d)	
Other	87 (6)	0–5	710 (47)
Surgery	38 (3)	6–10	552 (36)
Hospital		11–15	135 (9)
General hospital	522 (34)	16–20	57 (4)
Private hospital	197 (13)	21–25	20 (1)
University hospital	421 (28)	26–30	24 (2)
University affiliated general hospital	363 (24)	> 30	23 (2)
Other	18 (1)	Nurse:patients ratio (d)	
Type of ICU		1:1	164 (11)
Burn unit	4 (0.2)	1:2	976 (64)
Cardiac ICU	43 (3)	1:3	270 (18)
Coronary ICU	1 (0.1)	1:4	111 (7)
Mixed ICU	862 (57)	Nurse:patients ratio (night)	
Medical ICU	312 (21)	1:1	117 (8)
Neurologic ICU	41 (3)	1:2	677 (44)
Surgical ICU	170 (11)	1:3	527 (35)
Trauma ICU	24 (2)	1:4	200 (13)
Transplant ICU	12 (1)		
Other	52 (3)		
ICU setting			
Closed ICU	841 (55)		
Open ICU	183 (12)		
Semiclosed	487 (32)		
Other	10 (1)		

^aPercentage of patients receiving invasive mechanical ventilation over the total no. of ICU patients.

Table 2

Assess, prevent, and manage pain (A); spontaneous awakening trials (SAT) and spontaneous breathing trials (SBT) (B); Choice of analgesia and sedation (C).

Variables	Africa, n = 43 (%)	Asia, n = 441 (%)	Europe, n = 607 (%)	North America, n = 120 (%)	Oceania, n = 45 (%)	South America, n = 265 (%)	Total, n = 1,521 (%)
Assess, prevent, and manage pain							
Do you use protocol for pain treatment?							
No	31 (72)	114 (26)	256 (42)	45 (38)	29 (64)	110 (42)	585 (38)
Yes	12 (28)	327 (74)	351 (58)	75 (63)	16 (36)	155 (59)	936 (62)
Do you use any scale to evaluate pain in your unit?							
No	26 (60)	40 (9)	103 (17)	8 (7)	15 (33)	60 (23)	252 (16)
Yes	17 (40)	401 (91)	504 (83)	112 (93)	30 (67)	205 (77)	1269 (83)
Scale used to evaluate pain*							
Critical-Care Pain Observation Tool	0 (0)	46 (11)	52 (10)	70 (65)	6 (20)	41 (20)	215 (17)
Behavioral Pain Scale	1 (6)	140 (35)	129 (26)	14 (13)	1 (3)	53 (26)	338 (27)
Numerical Rating Scale	11 (65)	224 (56)	292 (58)	50 (45)	18 (60)	94 (46)	689 (54)
Visual Analogic Scale	5 (29)	272 (68)	284 (56)	21 (19)	12 (40)	86 (42)	680 (54)
Faces Pain Scale	7 (41)	80 (20)	99 (20)	19 (17)	9 (30)	39 (19)	253 (20)
Adult Nonverbal Pain Scale	2 (12)	7 (2)	52 (10)	19 (17)	3 (10)	17 (8)	100 (8)
Do you use preemptive analgesia before nursing procedure?							
No	32 (74)	154 (27)	92 (15)	13 (11)	2 (4)	69 (26)	362 (24)
Yes	6 (14)	370 (66)	315 (52)	29 (24)	11 (24)	124 (47)	855 (56)
At nurse's discretion	5 (12)	37 (7)	200 (33)	78 (65)	32 (71)	71 (27)	423 (28)
Drugs used for pain treatment*							
Fentanyl	7 (16)	386 (69)	402 (66)	118 (98)	44 (98)	242 (92)	1199 (79)
Hydromorphone	1 (2)	14 (2)	23 (4)	102 (85)	8 (18)	6 (2)	154 (10)
Morphine	21 (48)	310 (55)	523 (86)	84 (70)	41 (91)	203 (77)	1182 (78)
Methadone	4 (9)	4 (1)	42 (7)	20 (17)	14 (31)	59 (22)	143 (9)
Remifentanyl	4 (9)	112 (20)	376 (62)	1 (1)	8 (18)	68 (26)	569 (37)
Paracetamol	37 (86)	282 (50)	506 (83)	44 (37)	43 (96)	142 (54)	1054 (69)
Nonsteroidal anti-inflammatory drugs	37 (86)	291 (52)	327 (54)	54 (45)	24 (53)	86 (33)	819 (54)

Variables	Africa, n = 43 (%)	Asia, n = 441 (%)	Europe, n = 607 (%)	North America, n = 120 (%)	Oceania, n = 45 (%)	South America, n = 265 (%)	Total, n = 1,521 (%)
SATs and SBTs							
Do you perform SAT?							
No	33 (77)	71 (16)	322 (53)	7 (6)	18 (40)	62 (23)	513 (34)
Yes	10 (24)	370 (84)	285 (47)	113 (94)	27 (60)	203 (77)	1008 (66)
How many times do you perform SAT?							
As many times as possible	1 (10)	51 (14)	52 (18)	10 (9)	5 (19)	27 (13)	146 (15)
Every nurse's shift	0 (0)	26 (7)	20 (7)	9 (8)	0 (0)	1 (1)	56 (6)
I perform a sedation minimization strategy	3 (30)	49 (13)	76 (27)	16 (14)	10 (37)	39 (19)	193 (19)
Once a day	6 (60)	241 (65)	134 (47)	73 (65)	9 (33)	133 (66)	596 (59)
Other	0 (0)	3 (1)	3 (1)	5 (4)	3 (11)	3 (2)	17 (2)
Do you perform SBT?							
No	27 (63)	71 (16)	304 (50)	4 (3)	32 (71)	58 (22)	496 (32)
Yes	16 (37)	370 (84)	303 (50)	116 (97)	13 (29)	207 (78)	1025 (67)
Choice of analgesia and sedation							
Scale used to evaluate sedation*							
Motor Activity Assessment Scale	2 (5)	(1)	2 (0.3)	1 (1)	1 (2)	1 (0.4)	11 (1)
None	33 (77)	25 (6)	100 (16)	0 (0)	1 (2)	3 (1)	162 (11)
Other	1 (2)	1 (0.2)	8 (1)	3 (3)	0 (0)	1 (0.4)	14 (1)
Richmond Agitation Sedation Scale	5 (12)	273 (62)	290 (48)	108 (90)	37 (82)	214 (81)	927 (61)
Ramsey	2 (5)	120 (27)	186 (31)	1 (1)	1 (2)	26 (10)	336 (22)
Symptom Assessment Scale	0 (0)	18 (4)	21 (3)	7 (6)	5 (11)	20 (8)	71 (5)
Do you follow protocol for sedation in your unit?							
No	36 (83)	87 (20)	312 (51)	20 (17)	22 (49)	59 (22)	536 (35)
Yes	7 (16)	354 (80)	295 (49)	100 (83)	23 (51)	206 (78)	985 (65)
If yes, have you adopted a minimal or no sedation strategy?							
No	3 (43)	34 (10)	31 (11)	9 (9)	5 (22)	20 (10)	102 (10)
Yes	4 (57)	320 (90)	264 (89)	91 (91)	18 (78)	186 (90)	883 (90)
Do you attempt to minimize the use of benzodiazepines in your patients?							
No	9 (21)	38 (9)	91 (15)	3 (3)	1 (2)	14 (5)	156 (10)
Yes	34 (79)	403 (91)	516 (85)	117 (98)	44 (98)	251 (95)	1365 (90)
In a restless and agitated patient who screened positive at delirium assessment, how do you approach the sedation strategy after clinical evaluation?							
Delirium first→pain→sedation	2 (5)	31 (7)	62 (10)	10 (8)	4 (9)	28 (11)	137 (9)
Delirium→sedation→pain	3 (7)	9 (2)	22 (4)	4 (3)	1 (2)	3 (1)	42 (3)
None	4 (9)	2 (0.5)	24 (0.4)	0 (0)	3 (7)	4 (2)	37 (2)
Other	0 (0)	2 (0.5)	2 (0.3)	4 (3)	3 (7)	0 (0)	11 (1)
Pain→delirium→sedation	13 (30)	177 (40)	247 (41)	62 (52)	14 (31)	159 (60)	672 (44)
Pain→sedation→delirium	13 (30)	171 (39)	170 (28)	31 (26)	18 (40)	52 (20)	455 (30)
Sedation→pain→delirium	8 (19)	49 (11)	80 (13)	9 (8)	2 (4)	19 (7)	167 (11)

SAT = spontaneous awakening trial, SBT = spontaneous breathing trial.
*Multiple responses were possible.

Table 3

Delirium management (D)

Variables	Africa, n = 43 (%)	Asia, n = 441 (%)	Europe, n = 607 (%)	North America, n = 120 (%)	Oceania, n = 45 (%)	South America, n = 265 (%)	Total, n = 1,521 (%)
Do you routinely monitor delirium in your unit?							
Never	23 (54)	84 (19)	276 (45)	5 (4)	14 (31)	54 (20)	456 (30)
More than once a day	4 (9)	125 (28)	122 (20)	94 (78)	19 (42)	87 (33)	451 (30)
Once a day	16 (37)	232 (53)	209 (34)	21 (18)	12 (27)	124 (47)	614 (40)
Which tools do you routinely use to assess delirium?							
Confusion Assessment Method-ICU	6 (14)	310 (90)	259 (90)	131 (88)	28 (64)	205 (78)	536 (35)
Intensive Care Delirium Screening Checklist	0	15 (4)	23 (8)	13 (9)	0 (0)	1 (0.4)	102 (7)
None	36 (86)	18 (5)	5 (2)	5 (3)	16 (36)	56 (21)	883 (58)
Do you generally investigate the potential causes of delirium in your patients?							
No	7 (16)	101 (23)	199 (33)	18 (15)	10 (22)	54 (20)	389 (26)
Yes	36 (84)	340 (77)	408 (67)	102 (85)	35 (78)	211 (80)	1132 (74)
In your experience, how many patients have delirium in your ICU? (%)							
0–10	20 (47)	98 (22)	128 (21)	10 (8)	5 (11)	36 (14)	297 (20)
11–30	19 (44)	217 (49)	310 (51)	48 (40)	24 (53)	127 (49)	745 (50)
31–60	4 (9)	116 (26)	145 (24)	45 (38)	14 (31)	89 (34)	413 (27)
> 60	0 (0)	10 (2)	24 (4)	17 (14)	2 (4)	13 (5)	66 (4)
Do you prescribe earplugs to your patients?							
No	41 (95)	305 (69)	541 (89)	91 (76)	29 (64)	243 (92)	1250 (82)
Yes	2 (5)	136 (31)	66 (11)	29 (24)	16 (36)	22 (8)	271 (18)
Do you use nonpharmacologic interventions to promote sleep in your unit?							
Drug time optimization	4 (10)	30 (7)	47 (8)	4 (4)	2 (5)	34 (14)	121 (8)
Drug time optimization and noise reduction	1 (3)	5 (1)	30 (5)	6 (5)	0 (0)	6 (2)	48 (3)
Light optimization	6 (15)	118 (27)	72 (12)	10 (9)	1 (2)	42 (17)	249 (17)
Light optimization and drug time optimization	0 (0)	22 (5.1)	52 (9)	6 (5)	3 (7)	33 (13)	116 (8)
Light optimization, drug time optimization, and noise reduction	9 (23)	82 (19)	204 (35)	39 (34)	17 (42)	59 (23)	410 (28)
Light optimization and noise reduction	6 (15)	144 (33)	125 (21)	24 (21)	12 (30)	48 (19)	359 (24)
Noise reduction	13 (33)	31 (7)	62 (10)	26 (23)	6 (15)	30 (12)	168 (11)
Do you use protocols for the management of delirium?							
No	37 (86)	179 (41)	439 (71)	58 (48)	33 (73)	130 (49)	876 (58)
Yes	6 (14)	262 (59)	168 (28)	62 (52)	12 (27)	135 (51)	645 (42)

Variables	Africa, n = 43 (%)	Asia, n = 441 (%)	Europe, n = 607 (%)	North America, n = 120 (%)	Oceania, n = 45 (%)	South America, n = 265 (%)	Total, n = 1,521 (%)
How do you use haloperidol to manage delirium in your unit?							
None	6 (14)	29 (7)	44 (7)	16 (13)	6 (13)	11 (4)	112 (7)
Prevention of delirium	2 (5)	2 (0.5)	13 (2)	0 (0)	0 (0)	3 (1)	20 (1)
Prevention of delirium + sedatives minimization	0 (0)	4 (1)	9 (2)	0 (0)	0 (0)	3 (1)	16 (1)
Sedatives minimization	2 (5)	20 (5)	40 (7)	6 (5)	0 (0)	8 (3)	76 (5)
Treatment of delirium episode	27 (63)	351 (80)	368 (61)	58 (48)	33 (73)	148 (56)	985 (65)
Treatment of delirium episode + prevention of delirium	1 (2)	10 (2)	36 (6)	3 (3)	2 (4)	10 (4)	62 (4)
Treatment delirium episode + prevention of delirium + sedatives minimization	2 (5)	9 (2)	31 (5)	6 (5)	0 (0)	16 (6)	64 (4)
Treatment of delirium episode + sedatives minimization	3 (7)	16 (4)	66 (11)	31 (26)	4 (9)	66 (25)	186 (12)
Do you use quetiapine or other atypical antipsychotic for delirium with agitation?							
No	36 (84)	248 (56)	342 (56)	14 (12)	15 (33)	63 (24)	718 (47)
Yes	7 (16)	193 (44)	265 (44)	106 (88)	30 (67)	202 (76)	803 (53)
In which situation do you require a specialist consultation (i.e., psychiatrist, neurologist, geriatrician)?*							
All cases	12 (28)	70 (16)	42 (7)	2 (3)	2 (4)	12 (5)	141 (9)
Most challenging cases of delirium	31 (72)	337 (76)	370 (61)	62 (52)	21 (47)	144 (54)	965 (63)
Alcohol withdrawal syndrome	14 (33)	203 (46)	73 (12)	9 (8)	4 (9)	51 (19)	354 (23)
Posttraumatic stress disorder	14 (33)	195 (44)	110 (18)	25 (21)	8 (18)	55 (21)	407 (27)
Never	2 (5)	12 (7)	125 (21)	39 (32)	17 (38)	68 (26)	263 (17)

*Multiple responses were possible.

Table 4**Early mobilization and exercise (E)**

Variables	Africa, n = 43 (%)	Asia, n = 441 (%)	Europe, n = 607 (%)	North America, n = 120 (%)	Oceania, n = 45 (%)	South America, n = 265 (%)	Total, n = 1,521 (%)
Do you evaluate ICU-acquired muscle weakness in your unit?							
No	27 (63)	322 (73)	384 (63)	84 (70)	19 (42)	136 (51)	972 (64)
Yes	16 (37)	119 (27)	223 (37)	36 (30)	26 (58)	129 (49)	549 (36)
Total	43	441	607	120	45	265	1,521
Do you prescribe early mobilization to your patients?							
No	3 (7)	45 (10)	59 (10)	4 (3)	4 (9)	18 (7)	133 (9)
Only in nonventilated patients	1 (2)	29 (7)	65 (11)	9 (8)	8 (18)	24 (9)	136 (9)
Yes	39 (91)	367 (83)	483 (80)	107 (89)	33 (73)	223 (84)	1,252 (82)
Total	43	441	607	120	45	265	1,521
Do you use an ICU mobility scale for goal-directed early mobilization?							
No	31 (72)	326 (74)	466 (77)	58 (48)	36 (80)	179 (68)	1,096 (79)
Yes	9 (21)	70 (16)	82 (14)	58 (48)	5 (11)	68 (26)	292 (21)
Total	40	396	548	116	41	247	1,388
Do you have a dedicated mobility team in your ICU?							
No	38 (88)	346 (78)	402 (66)	83 (69)	31 (69)	152 (57)	1,052 (69)
Yes	5 (12)	95 (22)	205 (34)	37 (31)	14 (31)	113 (43)	469 (31)
Total	43	441	607	120	45	265	1,521

Table 5**Family involvement (F)**

Variables	Africa, n = 43 (%)	Asia, n = 441 (%)	Europe, n = 607 (%)	North America, n = 120 (%)	Oceania, n = 45 (%)	South America, n = 265 (%)	Total, n = 1,521 (%)
Is your unit open 24 hr per day to family members visit?							
No	25 (58)	234 (53)	490 (81)	21 (18)	9 (20)	204 (77)	983 (65)
Yes	18 (42)	207 (47)	117 (19)	99 (82)	36 (80)	61 (23)	538 (35)
Total	43	441	607	120	45	265	1521
How many hours is your unit open to family members if not 24 hr per day? (hr)							
0–5	18 (72)	213 (91)	314 (64)	2 (10)	0 (0)	176 (87)	723 (74)
5–10	2 (8)	5 (2)	36 (7)	11 (52)	0 (0)	4 (2)	58 (6)
10–15	0 (0)	1 (0.4)	6 (1)	1 (5)	2 (22)	1 (0.5)	11 (1)
15–20	5 (20)	15 (6)	134 (27)	2 (10)	4 (44)	23 (11)	183 (19)
≥ 20	0 (0)	0 (0)	0 (0)	5 (24)	3 (33)	0 (0)	8 (1)
Do you generally explain to family members what delirium is?							
No	16 (37)	87 (20)	122 (20)	16 (13)	11 (24)	32 (12)	284 (19)
Yes	27 (63)	354 (80)	485 (80)	104 (87)	34 (76)	233 (88)	1,237 (81)
Total	43	441	607	120	45	265	1,521
Do you use booklets or training material to improve delirium knowledge among family members?							
No	41 (95)	392 (89)	549 (90)	74 (62)	37 (82)	236 (89)	1,329 (87)
Yes	2 (5)	49 (11)	58 (10)	46 (38)	8 (18)	29 (11)	192 (13)
Total	43	441	607	120	45	265	1,521
Do you involve family member in the delirium management?							
No	20 (47)	111 (25)	255 (42)	26 (22)	8 (18)	74 (28)	494 (33)
Yes	23 (53)	330 (75)	352 (58)	94 (78)	37 (82)	191 (72)	1,027 (67)
Total	43	441	607	120	45	265	1,521
Do you use dedicated staff for managing the relationship with family members?							
No	28 (65)	239 (54)	511 (84)	82 (68)	32 (71)	127 (48)	1,019 (67)
Yes	15 (35)	202 (46)	96 (16)	38 (32)	13 (29)	138 (52)	502 (33)
Total	43	441	607	120	45	265	1521

SUPPLEMENTAL DIGITAL CONTENT

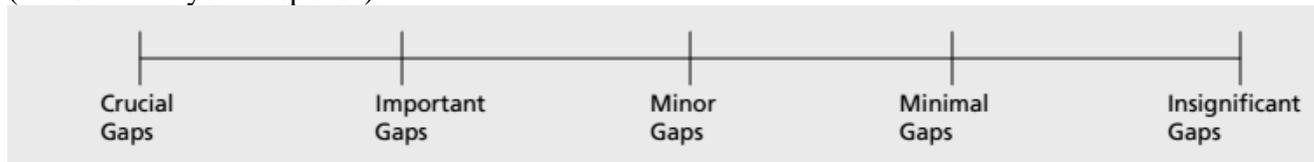
Appendix 1. Questionnaire for the survey generation: Clinical sensitivity testing

The investigators request your assistance in assessing the clinical sensitivity of the ABCDEF Worldwide Survey by answering the following questions:

1. To what extent are the questions directed at important issues pertaining to delirium in ICU population? (Please circle your response).

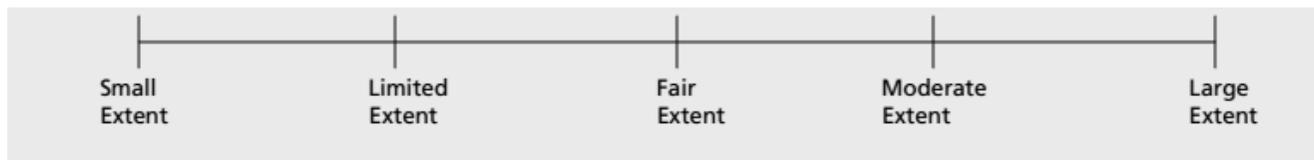


2. Are there important issues that should be included in the questionnaire which have been omitted? (Please circle your response).



Please identify any omissions: _____

3. To what extent are the response options provided simple and easily understood? (Please circle your response).



4. To what extent are questions likely to elicit information pertaining to your use of and experience with delirium in ICU population?

(Please circle your response).



5. How many items are inappropriate or redundant?
(Please circle your response).



Please identify redundant or inappropriate items: _____

6. How likely is the questionnaire to elicit interest in compilers?
(Please circle your response).



7. How long did it take you to complete the questionnaire? _____ minutes

Please feel free to provide any other feedback on the back of this form.

Thank you for assisting us with the sensibility testing of our questionnaire!

Appendix 2.

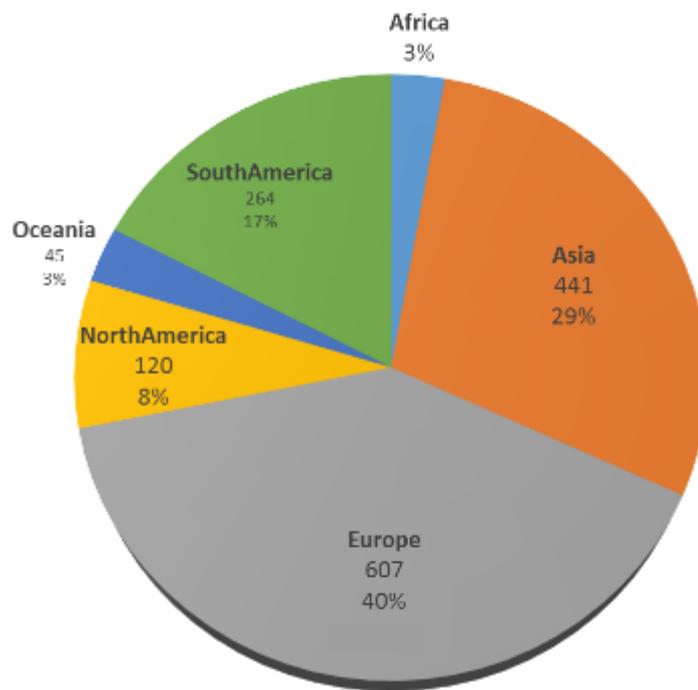


Fig.1: Continental distribution of the responders

Appendix 3. Country distribution of responders

Country	N (%)
Afghanistan	1 (0.1)
Argentina	64 (4.0)
Australia	35 (2.0)
Austria	1 (0.1)
Belgium	2 (0.1)
Brazil	159 (11.0)
Brunei Darussalam	1 (0.1)
Canada	42 (3.0)
Chile	15 (1.0)
China	39 (3.0)
Colombia	7 (0.5)
Costa Rica	1 (0.1)
Cyprus	1 (0.1)
Czech Republic	1 (0.1)
Denmark	1 (0.1)
Ecuador	4 (0.3)
Egypt	1 (0.1)
Ethiopia	40 (3.0)
France	48 (3.0)
Germany	20 (1.0)
Greece	9 (1.0)
Hungary	17 (1.0)
India	250 (16.0)
Ireland	1 (0.1)
Italy	371 (24.0)
Japan	19 (1.0)
Republic of Korea	105 (7.0)
Lithuania	1 (0.1)
Mexico	10 (1.0)
Netherlands	2 (0.1)
New Zealand	10 (1.0)
Norway	1 (1.0)
Other	1 (0.1)
Pakistan	1 (1.0)
Peru	4 (0.1)
Poland	45 (3.0)
Portugal	22 (1.4)
Qatar	1 (1.0)
Russian Federation	1 (0.1)
Saudi Arabia	5 (0.3)
Slovenia	6 (0.4)
Spain	36 (2.0)
Sweden	2 (0.1)
Switzerland	11 (1.0)

United Arab Emirates	2 (0.1)
United States	78 (5.0)
Uruguay	4 (0.3)

Appendix 5. Main combinations of passive and active physical exercises adopted.

Variables	Africa	Asia	Europe	North America	Oceania	South America	Total
Main Combinations of physical exercises							
PROM, walking, active physiotherapy	12 (28)	209 (47)	122 (20)	52 (43)	26 (58)	66 (25)	487 (32)
PROM	10 (23)	72 (16)	159 (26)	6 (5)	1 (2)	27 (10)	275 (18)
PROM, active physiotherapy	5 (12)	31 (7)	117 (19)	0 (0)	2 (4)	27 (10)	182 (12)
PROM, walking,	6 (14)	35 (8)	35 (6)	19 (16)	3 (7)	20 (8)	118 (8)
PROM, walking, active physiotherapy, cycle ergometry	0 (0)	5 (1)	34 (6)	27 (23)	4 (9)	37 (14)	107 (7)
Active physiotherapy	4 (9)	11 (2)	68 (11)	2 (2)	0 (0)	14 (5)	99 (7)
Walking	1 (2)	29 (7)	20 (3)	9 (8)	4 (9)	11 (4)	74 (%)
Walking, active physiotherapy	3 (7)	23 (5)	15 (2)	5 (4)	5 (11)	6 (2)	57 (4)
PROM, walking, active physiotherapy, cycloergometry, NMES	0 (0)	5 (1)	7 (1)	0 (0)	0 (0)	18 (7)	30 (2)
PROM, walking, active physiotherapy, NMES	1 (2)	7 (2)	5 (1)	0 (0)	0 (0)	7 (3)	20 (1)
PROM, active physiotherapy, cycloergometry	0 (0)	1 (0.2)	6 (1)	0 (0)	0 (0)	8 (3)	15 (1)
PROM, walking, cycloergometry	0 (0)	1 (0.2)	6 (1)	0 (0)	0 (0)	4 (2)	11 (1)
Active physiotherapy, NMES	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.1)
Active physiotherapy, cycle ergometry	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	2 (1)	3 (0.2)
Cycle ergometry	0 (0)	1 (0.2)	0,00	0 (0)	0 (0)	0 (0)	1 (0.1)
NMES	0 (0)	1 (0.2)	1,00	0 (0)	0 (0)	0 (0)	2 (0.1)
Walking, active physiotherapy, cycle ergometry	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	7 (3)	8 (0.5)
Walking, active physiotherapy, cycle	0 (0)	1,00	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.1)

ergometry, NMES							
Walking, active physiotherapy, cycle ergometry	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (1)	2 (0.1)
PROM, active physiotherapy, cycle ergometry, NMES	0 (0)	3,00	1 (0.2)	0 (0)	0 (0)	1 (0.4)	5 (0.3)
PROM, active physiotherapy, NMES	1 (2)	2,00	2 (0.3)	0 (0)	0 (0)	3 (1)	8 (0.5)
PROM, cycle ergometry	0 (0)	0 (0)	2 (0.3)	0 (0)	0 (0)	1 (0.4)	3 (0.2)
PROM, NMES	0 (0)	2 (0.5)	1 (0.2)	0 (0)	0 (0)	1 (0.4)	4 (0.3)
PROM, walking, cycle ergometry, NMES	0 (0)	0 (0)	1 (0.2)	0 (0)	0 (0)	0 (0)	1 (0.1)
PROM, walking, NMES	0 (0)	2 (0.5)	2 (0.3)	0 (0)	0 (0)	3,00	7 (0.5)
Total	43 (100)	441 (100)	607 (100)	120 (100)	45 (100)	265 (100)	1521 (100)
Who is part of the mobility team?							
Physical Therapist	1 (20)	21 (22)	95 (47)	6 (16)	5 (36)	27 (24)	155 (33)
Physical Therapist + Nurses	2 (40)	27 (29)	32 (16)	1 (3)	6 (43)	10 (9)	78 (17)
Physical Therapist + Nurses + Respiratory Therapist	0 (0)	17 (18)	14 (7)	7 (19)	0 (0)	17 (15)	55 (12)
Physical Therapist + Respiratory Therapist	0 (0)	3 (3)	32 (16)	0 (0)	0 (0)	10 (9)	45 (10)
Physical Therapist + Nurses + Respiratory Therapist + Occupational Therapist	0 (0)	1 (1)	5 (2)	12 (32)	0 (0)	4 (4)	22 (5)
Respiratory Therapist	0 (0)	1 (1)	5 (2)	0 (0)	0 (0)	15 (14)	21 (5)
Physical Therapist + Respiratory Therapist + Occupational Therapist	0 (0)	3 (3)	4 (2)	1 (3)	0 (0)	9 (8)	17 (4)
Nurses	2 (40)	5 (5)	6 (3)	0 (0)	0 (0)	2 (2)	15 (3)
Physical Therapist + Occupational Therapist	0 (0)	2 (2)	2 (1)	7 (19)	0 (0)	3 (3)	14 (3)
Physical Therapist + Nurses + Occupational	0 (0)	8 (9)	1 (0.5)	3 (8)	1 (7)	0 (0)	13 (3)

Therapist							
Nurses + Occupational Therapist	0 (0)	3 (3)	1 (0.5)	0 (0)	2 (14)	3 (3)	9 (2)
Nurses + Respiratory Therapist	0 (0)	0 (0)	1 (0.5)	0 (0)	0 (0)	7 (6)	8 (2)
Occupational Therapist	0 (0)	1 (1)	6 (3)	0 (0)	0 (0)	0 (0)	7 (2)
Respiratory Therapist + Occupational Therapist	0 (0)	2 (2)	0 (0)	0 (0)	0 (0)	4 (4)	6 (1)
Nurses + Respiratory Therapist + Occupational Therapist	0 (0)	1 (1)	0 (0)	0 (0)	0 (0)	2 (2)	3 (1)
Total	5 (100)	94 (100)	204 (100)	37 (100)	14 (100)	111 (100)	465 (99)

Data are expressed as number (percentage).

PROM: passive range of motion. NMES: neuro-muscular electrical stimulation.

Appendix 6: Implementation of the ABCDEF bundle according to academic vs non academic institution, ICU type (closed vs. open/semiopen), ICU volume (high volume >1000 admissions vs. low volume <1000 admissions)

Have you implemented the ABCDEF bundle (yes)?	
	N (%)
<i>Academic vs. non academic</i>	
Academic	313 (39.8%)
Non academic	353 (48.1%)
<i>ICU type</i>	
Closed	744 (55.6%)
Open/semiopen	111 (60.7%)
<i>ICU volume</i>	
<500	234 (52.9%)
500-1000	246 (57.1%)
>1000	236 (66.9%)
N/A	46 (59%)

Appendix 7: Specific interventions for delirium prevention according to nurses-patients ratio

	Nurses patients ratio (during the day)			
	1:1	1:2	1:3	1:4
Family involvement (yes)	119 (72.6%)	677 (69.2%)	155(57.4%)	76 (69.1%)
Ensure family presence (yes)	122 (74.4%)	764 (78.2%)	194 (71.9%)	93 (84.5%)
Minimizing physical restraints and catheter use (yes)	111 (67.7%)	586 (60%)	142 (52.6%)	76(69.1%)
Early exercise and mobilization (yes)	132 (80.5 %)	757 (77.5%)	201 (74.4 %)	87 (79.1%)

Appendix 8: Family involvement and the use of delirium prevention techniques.

Delirium prevention techniques*	Family involvement	
	Yes (n =1022)	No (n =487)
Awakening and breathing trial coordination	771 (75)	315 (64)
Pharmacological intervention to regulate sleep/wake cycle	808 (79)	330 (68)
Minimizing noise in the ICU	818 (80)	313 (64)
Minimizing physical restraints and catheter use	665 (65)	250 (51)
Early exercise and rehabilitation	844 (83)	333 (68)
Ensure family member presence	858 (84)	315 (65)

*Data are expressed as number (percentage).