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# BMJ Open Construction of reference criteria to admit patients to intermediate care units in France: a Delphi survey of intensivists, anaesthesiologists and emergency medicine practitioners (first part of the UNISURC project)

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## ABSTRACT

**Objectives** No consensus criteria describe the medical eligibility of the patients to intermediate care units (IMCUs). In this first part of the UNISURC project, we aimed to develop criteria based on a consensus of physicians from the main specialties involved in IMCU admission decisions.

**Design** We selected criteria from IMCU literature, scoring systems and intensive care unit nursing workload. We submitted these criteria to a panel of experts in a Delphi survey. We used a two-round Delphi survey procedure to assess the validity and feasibility of each criterion.

**Setting** Medical practitioners in either public or private French institutions and proposed by the national scientific societies of anaesthesiology, emergency medicine and intensive care. The Delphi rounds took place in 2015–2016.

**Outcome measures** Validity and feasibility of the proposed criteria; uniformity of the judgement across the primary specialty and the hospital category of the responders.

**Results** The criteria submitted to vote were classified as one of: chronic factor (CF); acute factor (AF); specific pathway (SP); nursing activity (NA) and hospital environment (HE). Of 189 experts invited, 81 (41%) responded to the first round and 62 of them (76%) responded to the second round. A definite selection of 63 items was made, distributed across 6 CF, 18 AF, 31 SP, 3 NA and 5 HE. Validity and feasibility were influenced by the specialty or the public/private status of the institution of the responders for a few items.

**Conclusion** We created a set of 63 consensus criteria with acceptable validity and feasibility to assess the medical eligibility of the patients to IMCUs. The second part of the UNISURC project will assess the distribution of each criterion in a prospective multicentre national cohort.

**Trial registration number** NCT02590172.

## INTRODUCTION

The appropriateness of care aims at improving quality, saving financial resources

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The study involved all specialties involved in intermediate care units admission and/or care.
- ⇒ Assessment was made by both public and private practitioners.
- ⇒ Candidate criteria were selected on an extensive analysis of prior literature.
- ⇒ The study was performed in a single country.
- ⇒ The study did not involve nurses.

and strengthening healthcare system sustainability.<sup>1</sup> The development of intensive care units (ICUs) 60 years ago led to significant improvement in the management of hospitalised critically ill patients.<sup>2</sup> Over time, advances in prehospital care, development of emergency departments and implementation of less invasive surgery have considerably changed the profile of patients requiring ICU admission. These changes were the premise of the introduction to different levels of severity for patients admitted to critical care.<sup>3</sup>

Intermediate care units (IMCUs) have been implemented in many countries to treat patients whose instability of physiological parameters require equipment-based monitoring but low-level organ support. They can be used as ‘step-up’ or ‘step-down’ units between the general ward and the ICU.<sup>4</sup> Patients referred to an IMCU in a ‘step-up’ come from the emergency department, the ward or the operative room,<sup>5,6</sup> while those referred in a ‘step-down’ way come from the ICU. While they cannot replace ICUs for patients requiring mechanical assistance,<sup>7</sup>

IMCUs may help reduce ICU use in moderately acute patients<sup>8-10</sup> and likely hospital costs.<sup>11</sup>

In particular, a large portion of patients admitted to the ICU do not receive advanced organ support,<sup>12</sup> raising the question of admission criteria. The criteria for admission in North American IMCUs were initially developed by the Society of Critical Care Medicine and included as many as 48 different situations.<sup>13</sup> Worldwide, the appropriateness of IMCU stay is usually assessed a posteriori by measures of nursing workload and scores derived from the simplified Therapeutic Intervention Scoring System (TISS) score.<sup>14 15</sup> However, admission criteria depend on numerous factors, such as physician decisions, bed availability, local practices and patient-specific physical conditions, as well as noting organisational practices vary largely across institutions.<sup>6 16 17</sup>

In the 1990s, France developed a network of IMCUs, involving 766 hospitals, leading to a total of 8217 beds in 2017.<sup>17</sup> Concurrently, the French Societies of Anaesthesia, of Intensive Care, and of Emergency (SFAR, SRLF and SFMU) published national guidelines to define and organise IMCUs.<sup>18</sup> Since 2005, the financing of French hospitals is based on an adapted diagnosed related groups system.<sup>19</sup> For IMCUs, the activity is assessed with the severity of the patient at admission, evaluated with the Simplified Acute Physiology Score II (SAPS II),<sup>20</sup> the presence of diagnoses and the use of procedures, the lists of which were defined and then incremented empirically between 1995 and 2010.<sup>21</sup>

In its current form, this system ends up funding only 50% of all actual stays in IMCU, partly because of the lack of precision or relevance of the criteria. As a result, the financial income of IMCUs is largely lower than their cost, and may compromise their long-term sustainability.<sup>22</sup> However, it is now possible to extract case-mix, relevance of IMCU use and clinical performance of IMCUs from hospital databases to understand and quantify the financial gap. UNISURC is a two-part project which aims at selecting reference criteria medically pertinent to admit patients to IMCU in France, and assessing their distribution in a prospective multicentre nationwide cohort of patients eligible to IMCU. We present here the selection of medical criteria as the first part of the project.

## METHODS

### Organisation

The Steering Committee (SC) of this project gathered intensivists, anaesthesiologists, emergency medicine practitioners and methodologists. As project data would be obtained by a field survey, a prerequisite was to define, in a consensual manner, the set of data to be considered. These items would then be retrieved during a nationwide observational survey to model their association with appropriate admission and then calculate an admissibility score.

Three principal patient pathways to IMCU were considered: postoperative room, emergency department and

discharge from ICU. We did not consider hospital wards because of their heterogeneity across hospital structures. The SC anticipated relevance of a patient admission into IMCU might depend on criteria belonging to the following dimensions: chronic factor (CF); acute factor (AF); specific pathway (SP); nursing activity (NA) and hospital environment (HE).

We decided not to consider exclusion criteria since the presence of both appropriateness and inappropriateness items could hamper the convergence of consensus on simple and usable rules.<sup>23</sup>

### Candidate set of items

The items selected for the survey were mostly based on anaesthesia, intensive care or emergency literature, on a review of criteria used daily in the units of the members of the SC, and on personal experience.

Candidate conditions were derived from symptoms or syndromes described in the International Classification of Diseases, 10th version<sup>24</sup> and procedures described in the French Classification of Medical Activities.<sup>25</sup> Several criteria derived from scoring systems assessing the general severity at admission (the SAPS II<sup>20</sup>) or the nursing workload dedicated to intensive and intermediate care patients (the intermediate-TISS, the Nine Equivalents of nursing Manpower use Score, the Nursing Activity Score and the *Projet de Recherche en Nursing* adapted to intensive care score<sup>14 26-29</sup>). We added some items specific for each of the three pathways to or from IMCUs. The whole gathering process led to a large list of potential admission conditions.

### Panellist selection procedure

The experts were required to have both theoretical knowledge and practical experience with the decision-making process on admitting, treating or discharging patients from or to the IMCU. They should include anaesthesiologists, intensivists and emergency practitioners to represent the specialties most likely to interact with IMCUs. Each expert should be volunteer and have an experience in acute care hospital medicine longer than 3 years. The SC asked the executive boards of the three corresponding French scientific societies (SRLF, SAFR and SFMU) to propose a panel of a maximum of 100 practitioners skilled in evaluation of the intensive care patients, and practicing in either public or private hospitals.

### Consensus method

Considering the large number of respondents, we opted for a Delphi procedure. The study was conducted in accordance with the Conducting and Reporting of Delphi Studies (CREDES) guidelines for conducting and reporting Delphi studies (online supplemental file 1).<sup>30</sup> A number of two successive rounds was set a priori, with the last one thought as a restitution of the results, according to recommendations of Delphi survey good planning.<sup>31</sup> The candidate items were presented on a dedicated and secured website describing each condition in detail. The

experts had to independently score their agreement with each item in a questionnaire, on both the validity (the relevance to characterise or justify admission to an IMCU or to continue the IMCU stay) and the feasibility (the fact the item is simple to understand and easy to collect) of each item. These two characteristics were evaluated on a numeric scale, from 1 (not valid or not feasible) to 9 (very valid or very feasible) points. Then, the practitioner should indicate sufficiency, as whether the item was a sufficient condition for admission, alone or associated with other items, and potentially suggest thresholds. Finally, each expert was informed they could add comments on these items or propose new items the SC had not yet considered.

This online survey was pilot-tested with six professionals not participating in the Delphi survey itself. Access to the survey was by means of a personal code guaranteeing unique individual completion. The practitioners were requested to respond within 2 weeks. No financial compensation was offered.

After the first round, the items whose median value of validity and feasibility was in the upper tercile (between 7 and 9) with an agreement of more than 60% of the participants, were retained as consensual. Items in the lower tercile (1–3) were rejected. The other situations were kept to be re-examined in the second round. The overall results, the individual position of the expert for each item, and the degree of convergence or divergence with the rest of the respondents were returned individually to the experts. They were asked to reconsider their scores when no consensus had emerged for a given item. Only participants who completed the first round were invited to the second round. After the second round, the accepted items had to fulfil the same selection criteria and to be considered sufficient for admission by more than half of

the panel of responders. Interactive care sessions between several responders and the SC were organised to finalise the wording of propositions.

The selection of the panel of experts took place between February 2012 and March 2013. The voting website for the Delphi round was delivered in June 2015 and the first round lasted from June to December 2015. The achievement of the consensus on criteria and rules that may define the appropriateness of admission to IMCU required a second round (third quarter of 2016) and was completed by December 2016.

### Statistics

Descriptive statistics were used to analyse and report data, including percentage agreement, mean and median and equimedian (defined as the median weighted by the size of each group—specialty of the responders, category of the responder’s hospital) score and IQRs. The item scores were compared between the groups of respondents with the non-parametric Kruskal-Wallis test. The proportions of high scoring (between 7 and 9) for each item were compared between groups of respondents by a  $\chi^2$  test.

### Patients and public involvement

None.

## RESULTS

### Panel of experts

We asked 189 experts for participation. Among them, 81 (41%) responded to the first round of the Delphi survey (table 1). These experts were practicing in 62 facilities, were mostly anaesthesiologists (n=39/81, 48%), with experience of 24<sup>17–30</sup> years in their field, and were practicing mostly in public (either community

**Table 1** Characteristics of the panel of experts at first round (N=81) and second round (n=62)

Parameters	Characteristics	First round (n=81) n (%) or med (IQR), min–max	Second round (n=62) n (%) or med (IQR), min–max
Gender	Female	7 (8.6)	7 (11)
	Male	74 (91.4)	55 (89)
Age (years)	Median (IQR), min–max	53 (46–60), 32–67	54 (47–59), 33–68
Years of expertise	Median (IQR), min–max	24 (17–30), 5–41	25 (18–31), 6–42
Setting	University-affiliated hospital	45 (55.6)	34 (54.8)
	Community or not-for-profit hospital	14 (17.3)	11 (17.7)
	Private hospital	15 (18.5)	12 (19.4)
	Others (accredited private, firemen, cancer centre)	7 (8.6)	5 (8.1)
Field of expertise (main)	Anaesthesiology	39 (48.1)	28 (45.2)
	Medical intensive care	21 (25.9)	15 (24.2)
	Surgery	10 (12.3)	9 (14.5)
	Emergency	9 (11.1)	8 (12.9)
	Pneumology	1 (1.2)	1 (1.6)
	Chief nurse	1 (1.2)	1 (1.6)

**Table 2** Final selection of criteria

Category	Chronic factor	Acute factor	Specific pathway	Nursing activity	Hospital environment
<b>Dimension</b>					
General	ASA score	SAPS II score	Discharge from the ICU	Continuous monitoring	Unscheduled discharge from the ICU
	End-stage renal failure	SOFA at discharge of the ICU	Acute pancreatitis		Postanaesthesia care unit not available
	Sepsis		Caustic poisoning		No dedicated unit for the patient's disease
			Drug poisoning requiring antidote		
			Drug poisoning requiring monitoring		
			Non-scheduled surgery		
			Elective surgery		
			Enterocystoplasty		
			Major liver surgery		
			Major lung surgery		
			Major stomach surgery		
			Major surgery of the oesophagus		
			Obstetrical emergency		
			Pancreatic surgery		
			Pelvectomy		
			Thoracic aorta surgery		
Haemodynamic	Severe hypertension	Acute coronary syndrome	Expected postoperative haemorrhage	Pulmonary artery catheter	No dedicated coronary care unit
	Chronic heart failure	Acute heart failure	Liver contusion	Arterial catheter	
		Anaphylactic shock	Spleen contusion		
		Blood lactates	Heart contusion		
		Heart rate	Multiple trauma		
		Haemodynamic instability	Documented bleeding risk		
		High-grade atrioventricular block			
		Mean arterial pressure			
		Symptomatic atrial fibrillation or flutter			
Respiratory	Chronic lung disease	Pulse oxygen saturation	Hemoptysis		No dedicated stroke unit

Continued

Table 2 Continued

Category	Chronic factor	Acute factor	Specific pathway	Nursing activity	Hospital environment
	Obstructive sleep apnoea syndrome	Respiratory rate	Lung contusion		
			Pneumothorax		
			Stridor		
			Tracheal aspiration and hypoxaemia		
Neurological		Glasgow coma score	Acute brain contusion		
			Major brain surgery		
			Major spine surgery		
Biological		Blood pH	Diabetic ketoacidosis		
		Kalemia	Lactic acidosis		
		Natremia			

ASA, American Society of Anesthesiology; ICU, intensive care unit; SAPS II, Simplified Acute Physiology Score II; SOFA, Sequential Organ Failure Assessment.

or university-affiliated) (n=59/81, 73%), or in private hospitals.

Out of the 81 participants in the first round, 62 (76%, 33% of original 189) responded to the second round. The characteristics of the two successive panels of responders were similar. The usability of the website was rated as good and the time to complete the survey was estimated to be between 20 and 40 min.

### Delphi rounds

The SC selected a total of 107 criteria to submit for the Delphi survey. These items were distributed across five categories, as CF (n=29), AF (n=26), SP (n=35), NA (n=11) and HE (n=6). The list of these candidate criteria is provided in online supplemental table 1.

After the first Delphi round (online supplemental table 2), 52 items were retained, 51 based on their ranking by the experts, and the SAPS II criterion (AF17) despite its low feasibility parameters. These items are distributed as follows: CF (n=28), AF (n=10), SP (n=6), NA (n=8) and HE (n=3) (online supplemental table 3). No item was rejected. The remaining 55 items had insufficient concordance for feasibility or validity and were resent for a second Delphi round. The definitions of three items were clarified based on respondents' comments: pneumothorax (indication for urgent drainage), complex dressing (duration >1 hour with two persons or >2 hours) and duration of nursing care (>2 hours per team). Validity was less frequent ( $\geq 60\%$  for 48% of items) than feasibility ( $\geq 60\%$  for 88% of items).

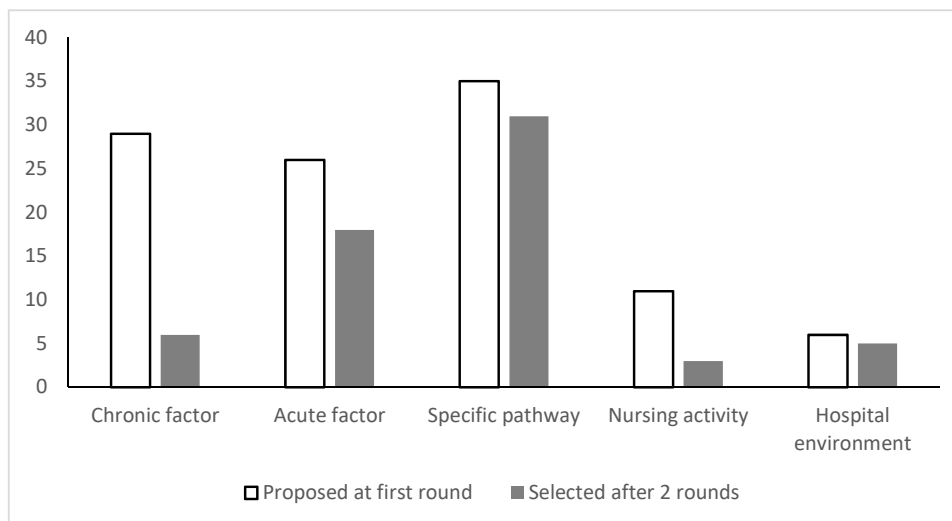
After the second Delphi round (online supplemental table 4), 11 additional items were retained. These items are distributed as follows: CF (n=28), AF (n=10), SP (n=6), NA (n=8) and HE (n=3) (online supplemental table 5). Validity was less frequent ( $\geq 60\%$  for 20% of items) than feasibility ( $\geq 60\%$  for 87% of items) or sufficiency ( $\geq 60\%$  for 96% of items).

In total, 63 items were retained from the two Delphi rounds. The list of these items is displayed in table 2. These items were distributed as follows: CF (n=6), AF (n=18), SP (n=31), NA (n=3) and HE (n=5) (online supplemental table 6). The result of the overall process of selection is summarised in figure 1.

### Uniformity of judgement

#### Primary specialty of the responders

The global medians and equimedians across professional categories of the responders were similar for the validity and feasibility estimates at both rounds. In the first round, the validity estimates were dependent on the profession category for four items—the ASA score, chronic heart failure, complete lack of patient cooperation and chronic lung disease (online supplemental table 7), and the feasibility estimates were dependent on the profession category for 10 items—Charlson comorbidity score, history of peptic ulcer disease, connective tissue disease, AIDS, active cancer, current immunosuppressive therapy, pneumothorax, discharge from the ICU,



**Figure 1** Distribution of the final selection of admission criteria to an intermediate care unit.

continuous drug infusion and central venous line. We did not observe differences according to gender or seniority of the responders.

#### Hospital category of the responders

Global medians were similar for the validity and feasibility estimates. The equimedian across the hospital categories of the responders was lower than the global median for Charlson score and severe hypertension (lower scores issued from non-private hospitals) and higher for bariatric surgery. The validity estimates were dependent on the hospital category for five items—kalemia, SAPS II, haemodynamic instability, skin mottling, stridor (online supplemental table 8)—at first round, and for six items—Charlson comorbidity score, severe hypertension, paraplegia, calcaemia, bariatric surgery, duration of nursing care and acute medical pathology management at night or on weekends (online supplemental table 9)—at second round. We did not observe differences in feasibility estimates.

## DISCUSSION

Using a Delphi survey among a large group of medical experts from different specialties involved in acute care in France, we were able to select a set of 63 items whose validity and feasibility scores designated them as potentially good criteria for identifying patients eligible for admission to IMCU. These criteria belong to five pre-established dimensions and their acceptance was similar across the specialties of the responders and the funding categories—public versus private—of their hospitals.

The decision to admit a patient to an ICU is easy in case of life-threatening situation. However, admission to an IMCU as a step-up or a step-down in the patient pathway is a more challenging decision. For instance, admission to IMCU could be mostly related to the prevention of the occurrence of complications for high-risk patients than to the care of acute conditions, as suggested by the proportion

of 40% of these items among final selection. Admission to an IMCU may contribute to a better use of hospital resources in reducing excessive and inappropriate use of ICU<sup>8,32</sup> and to improved security in reducing the inappropriate location in a conventional ward. The mortality of patients admitted to ICU may be lower in hospital having IMCU units.<sup>33</sup> To optimise the potential benefit in both resource use and patient security, standardised adequate triage is considered essential.<sup>11</sup> While a number of evaluation tools have been developed to describe and quantify the activities in IMCUs,<sup>34</sup> our method attempted to fill the gap concerning the appropriateness of IMCU use. The contribution of a large and diverse panel of experts via a two-round Delphi consensus study, made it possible to define a worthwhile set of criteria. Our results delineate a set of criteria to be considered as potential markers of the medical or technical eligibility to IMCU. The second part of the UNISURC project will assess the distribution of these criteria in a nationwide hospital cohort of patients eligible to an IMCU. Our search for criteria encompassed recognised items that assess medical diagnoses, nursing activity and logistic criteria that have been used by other authors.<sup>35</sup> We added criteria based on the professional experience of the experts. The Delphi experts originated from 62 hospitals, reflecting various patients' pathways, personal backgrounds and IMCU organisations. The voting application was pilot tested and did not constitute any kind of barrier. Finally, we followed most of the reporting standards for CREDES ensuring a reliable and precise consensus process.<sup>30,36</sup>

Our results are in accordance with previous initial guidelines highlighting that selected admission criteria to IMCU were mostly related to AF and SP including conditions corresponding to postoperative or post-traumatic monitoring requirement.<sup>8</sup> Conversely, CF and NA were less frequently retained. Finally, factors related HE, while not usually proposed as eligibility criteria, were underlined. Beds availability in other critical care unit

(postanaesthesia care unit, coronary or stroke unit, etc) were considered as pertinent admission criteria to IMCU.

Once validated in real-life populations, our criteria may help practitioners to admit patients with a primary goal of patient's safety rather than financial issues. They also may help decision-makers to adjust quality indicators, and pricing and reimbursement pricing systems.

This study has several limitations. First, the results may have been influenced by the participating experts. By design, the characteristics and the number of participants in a Delphi survey are always questionable.<sup>37</sup> The top-down sampling method via professional societies might have introduced a sampling bias resulting in most respondents being overall very experienced, and working in university-affiliated hospitals, which might impede generalisation in other settings. The lack of consensus on some items could also reflect cultural/professional differences regarding admission decisions. Second, the expert groups involved almost only doctors, while nurses play a central role in the care of IMCU patients. This is explained by the decision-making role of the doctor in France in the admission process. This may have led to several aspects of the patient's admission criteria being overlooked. This was partly compensated by the fact that we inserted items from the literature on nurses' workload. Third, we obtained a few proposals for modifications, which could reflect too much homogeneity between the scientific committee and the respondents, or indicate a lack of understanding or of interest. Fourth, there was a 1-year delay between the first and the second round that may contribute to the decrease in number of participants. At last, our Delphi survey was performed in the French health context, and its relevance for other countries requires further exploration. Fifth, the data was collected in 2016 and might be considered old. However, the age of this type of data does not have a significant impact on our results because the items submitted to the Delphi rounds did not vary over time (the techniques used to treat critically ill patients do not have much changed in recent years), and the structure of the health system has not changed, at least in France, over this period.

## Conclusion

Addressing the issue of appropriateness of admission to IMCUs in France based on items distributed across five dimensions of patient care and hospital characteristics, we selected a consensus set of 63 criteria with acceptable validity and feasibility to assess the medical eligibility of patients to IMCUs. The second part of the UNISURC project will assess the distribution of each criterion in a prospective multicentre national cohort.

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