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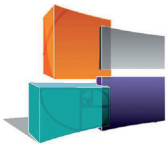

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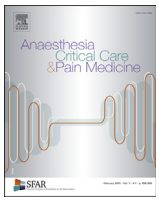

Editorial

Obstetric critical care patients in France: Admission shift from general intensive care units (ICU) to general high-dependency units (HDU) and now to obstetric high-dependency units (OHDU)?

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Admission of pregnant or postpartum women to an intensive care unit (ICU) is an indicator, which has been repeatedly used in the last 40 years in order to identify women at risk of major complications during or after pregnancy [1–4]. Indeed, it is an easily identified endpoint for audit and often considered to be a useful marker of the overall quality of the healthcare system. In addition, due to the low numbers of maternal deaths in Western countries, analysis of trends and suggestions for improvement become difficult. Since maternal admissions in ICU may be 10–100 times more frequent than maternal deaths, but with similar underlying aetiologies, epidemiological studies are facilitated and propositions to improve patterns of care are based on more significant information.

Interestingly, the overall admission has not varied widely during these 40 years, remaining between 1–10 for 1000 deliveries. It is usually in the lower part of this range in Western countries, but may be much higher in low-resource countries [5].

Although the rate of admissions may be influenced by the availability and proximity of an ICU, the main factor modifying the above-mentioned rate is probably the trigger for admission. In ICUs in which admission requires the need for organ support (mainly mechanical ventilation), rates are lower than when the overall severity of disease (organ dysfunction) only is considered. In some studies, the need for mechanical ventilation is low (25% in the study by Demirkiran et al. [6]) but may be much higher in other studies [7]. The length of stay in the ICU is also markedly related to the aetiology and need for organ support. The duration of ICU stay is often 1–3 days in the most commonly encountered situations. Longer duration is associated with more severe disease, multiple organ failure and organ support. Mortality also rises with an increasing number of failing organs [8] and ranges between 1 and 20% according to the underlying cause of admission.

The study performed by Barry et al. [9] is a useful addition to our current knowledge for several reasons. First, it adds recent data to what we already know, although the study included maternal admissions for a relatively short period (2010–2014). This might be a significant limitation since major changes are rapidly arising in France regarding organisation of obstetric care. For example, the number of French maternity units has decreased from 1000 in 1985 to 500 in 2014 [10], and because the total number of deliveries in this country has not changed significantly, the number of deliveries per unit has increased at a corresponding rate. This evolution generates an increasing number of large-volume units, which are now more often located in large and public hospitals, which can manage frail neonates and mothers as they are more likely sited close to neonatal (but also maternal) ICUs [10]. According to the French definition of obstetric levels of care, 26% of maternity units corresponded to level-3 units (i.e. neonatal reference units) in 2016, whereas the proportion was 19% in 2003 [11].

The distribution of causes is also in agreement with other studies. Even if postpartum haemorrhage and preeclampsia were the main causes (similar to most previous studies), an increase in cerebrovascular and cardiovascular causes is reported as previously observed in the UK and US registers [12,13].

An additional strength of the study by Barry et al. [9] is the analysis performed at the regional level. Previously, studies were conducted at a local [6,14] or national level, but few were conducted at a national level and also included analysis at the regional level. This has mainly been done in large countries such as the USA [3], but distribution among regions was rather simplistic, i.e. in four quadrants (Northeast, West, South, Midwest) with minor differences between regions, probably due to the too large surface area covered by each region. In the present analysis, a much wider range of ICU admissions rate was disclosed, i.e. between 2 and 8/1000 deliveries. Even if only mainland France is considered, the ratio between regions with the highest rate and those with the lower rate is around 2. Such variation in the rate of admissions among regions is sometimes obvious to understand, for example Mayotte has an extremely high rate of migrant women with very low socio-economic levels and pregnancies that are poorly or not followed. Elsewhere, differences may be more

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difficult to interpret. Is there a variable rate of severe maternal diseases in the different regions? This is likely as the Ile-de-France region (as well as other large cities) concentrates patients with poor medical and social conditions, leading to an increased risk during pregnancy. Studies in other countries (UK and USA notably) have also shown how social conditions can impact the rate of obstetric complications and increase the rate of stroke or myocardial infraction [12,13,15]. The bed availability could influence the admittance rate, as suggested by Barry et al. [9].

Another interesting and useful information is that the overall incidence of maternal admissions during pregnancy or postpartum is in the range described by most studies. However, Barry et al. reported a decrease in the incidence of admissions in contrast to US data and other countries [5]. The decrease in the number of admissions was however parallel to an increase in severity of patient diseases, as reflected by the increase in mean SAPS score, from 18 to 22 during the study period. The main two hypotheses to explain this unusual trend are:

- A true decrease in the need for ICU admission, which would be related to a reduced absolute number of patients with severe disease involving organ failure, suggesting better overall care and prophylaxis of degradation. This is a plausible interpretation; in a recent US national analysis of admission of pregnant women with a diagnosis of myocardial infarction, although the rate increased, hospital length of stay and mortality rate decreased, suggesting an improved quality of care [15]. In the field of postpartum haemorrhage (PPH) also (one of the major causes of admission), mortality has recently been shown to decrease in France [16] and the need for complex interventions such as arterial embolisation seems to be much less frequent than ten years ago.
- Additionally and more probably, ICU admittance rate could be influenced by a change in hospital organisation. French hospitals have introduced within the last 20 years an intermediate care level (i.e. high-dependency units [HDU]) for patients whose disease severity is such that they cannot remain in traditional wards, but also not severe enough to require admission to an ICU, the latter being more closely associated with the need to support organ failure. The reduction in ICU admission is likely related to the corresponding increase in maternal admission to HDU. If one adds the number of parturients admitted to French ICUs (even if the rate is decreasing) to that of those admitted to an HDU, then the overall rate is increasing; a trend that aligns with international data. It is likely that this shift toward admission to HDUs will continue both in France and elsewhere. Indeed, the case fatality rate reported in the present study (i.e. 1/77 [1.3%]) is much lower than the usual death rate in ICUs. The mean severity score (i.e. the SAPS II score) was moderately low, except in rare situations such as amniotic fluid embolism, in which they may reach values (i.e. 44) encountered in more traditional ICU cases [17]. In addition, predictive scores such as the SAPS II score are frequently reported to be inadequate, due to physiologic modifications observed in pregnant women [18]. This was observed again in the present study since the mean SAPS II score predicts a 4.2% mortality rate, while a 1.3% rate was observed. Recently, the total SOFA score was reported to better predict either death alone [19] or severe maternal outcome (death and maternal near miss) [20].

Moving forward to obtain a better ratio between patient outcomes, patient needs and logistical or financial constraints, has led to create obstetric intermediate care units, more often named obstetric high-dependency units (OHDU) [7]. The goal is to better distribute care and better match severity and needs for it. PPH and preeclampsia are the most common cause of admission to ICU, but in fact, patients with these conditions rarely need to be admitted there, as organ failure requiring artificial support is rare. Minimally advanced care (intravenous drugs administered by syringe pumps, non-invasive respiratory therapy, continuous non-invasive monitoring, biological workups at large intervals, foetal monitoring several times a day) is usually enough. OHDU may be advantageous, because they would provide a greater proximity between patients and obstetric (and neonatal) services, facilitating patient information, repeated surveillance by experienced and specialised personnel, and more rapid decisions. In addition, patient and staff satisfaction may be increased due to reduced stress related to ICU activities (light, noise…), mother-neonate separation and need for intra-hospital transport [7,21]. Finally, ICU beds may remain available for real needs and costs might also be reduced.

However, OHDUs are not so easy to create and organise. Problems are mainly related to the mismatch between organisational constraints (healthcare personnel and available place) and the number of patients requiring referral to OHDU. For example, in an Indian maternity and over a four-year period, 5052 deliveries were recorded, but only 57 parturients required HDU admission [22]. Such a rate (i.e. 1.1%) may be similarly observed in France and other Western countries. For example, a maternity unit with 5000 annual births, and an incidence of severe preeclampsia or PPH of 1% each, would represent 100 cases per year. If other indications for OHDU referral, such as postoperative cases, other but more rare maternal indications are added, this would represent a total of 200 cases/year. If a mean duration of stay of 2 days is considered, 400 bed-days are needed, i.e. slightly more than one OHDU bed over the year. It would obviously be difficult to staff a unit for such a small activity. In addition, it has recently been shown that only one third of women admitted to HDUs require this level of care, and the remainder requires higher levels of monitoring only [23].

Several solutions may be proposed to overcome this mismatch:

- enlarge indications and facilitate admission in the OHDU of patients with a lower degree of disease severity (this may occur if the unit implements an early warning system since providers would be alerted earlier) [24];
- positioning the OHDU close to the PACU (or even in the same room), allowing to improve staff utilisation, especially at night;
- increasing the total number of births in the maternity unit;
- increasing the specialisation of the unit and create this type of unit in Level-3 maternity units only.

In summary, although the study by Barry et al. lacks details on types of diseases, types of organ failure, organ supply devices used, other treatments required, and evolution (short and long-term), it reported useful data that may provide information for healthcare administrators and managers, and help us define in a more precise way which organisation would best increase maternal safety. This study should be widely disseminated and authors encouraged performing additional studies on this database.

Disclosure of interest

The authors declare that they have no competing interest.

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