Original Article

When can obstetric risk be predicted?

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ABSTRACT

Objective: The aim of the study was to assess the chronology of the appearance of perpartum obstetric risk factors (POR) in order to define the best moment to evaluate the type of management to which women will be oriented. We have secondarily studied the extent to which inappropriate medical interventions play a role in the genesis of some complications in the deliveries of women who are in principle at low risk.

Materials and methods: We conducted a prospective cohort study from January 1 to June 30, 2015 at the Croix-Rousse Hospital of Lyon, a level III maternity, and the Valence Hospital Center, a level II maternity, including all women giving birth at 24 to 42 weeks of gestation at hospital. The women were divided into two groups : one with no known perpartum obstetric risk (POR-) and the other with at least one obstetrical perpartum risk factor (POR+), defined at three different stages (at the last pregnancy monitoring consultation, at the onset of labor at the admission in the delivery room, and at the end of labor just before expulsive efforts). We observed medical interventions and foeto-maternal complications in each group. A non-simple delivery was a delivery involving a medical intervention, or a maternal or neonatal complication, or any combination of these. A secondary retrospective analysis of the practices and management was made for women initially considered POR- at the onset of labor but who had a non-simple delivery to assess adherence to current guidelines according to an audit schedule.

Results: Among 1975 women, we identified 32% women as POR- at end of pregnancy, 21% at start of labor and 20% at end of labor. Among the POR- women at start of labor, 16% had a non-simple delivery. 35% of these non-simple deliveries might perhaps have been avoided by closer adherence to current recommendations. Nonetheless 54% of these women still had an unpredictable and inevitable non-simple delivery that in some cases required an extremely rapid intervention.

Conclusion: Determining and predicting pregnant women who will need additional resources in addition to the usual obstetric and neonatal care is difficult. This identification should be made at the admission for delivery and this risk should be reassessed during labor. There are no women at zero risk of intervention. Therefore, delivery in demedicalized units should not take place in isolated or distant free-standing facilities.

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Introduction

The conditions of pregnancy and delivery have evolved considerably in developed countries over the past half-century [1], and most indicators of obstetric care quality and safety show marked improvement. In France, most of the deliveries take place in public hospitals, especially in services with more than 2000 deliveries a year, in level II and level III maternities. They are performed by a midwife in more than half of cases [2].

Several maternity services satisfaction surveys show that standardized and protocolized care is not suitable for all women, with some women having the impression of giving birth in "baby factories" with a sanitized and too medicalized environment [3–9].

Today we are witnessing an increased demand for care that is less technical, more personalized, and more "human" [3–9]. Proof of this demand can be seen in the experimentation in France with birth centers (or midwifery-led units), now underway for 3 years, and in the upsurge of home deliveries. Birthing centers have existed for years in other countries, but in France, law n° 2013-1118

of December 6, 2013 [7] has authorized their experimentation only recently, under the supervision of the High Authority of Health [6] with the decree of 26 November 2015 limiting the list of birthing centers authorized to the number of eight [10].

Studies have shown that it is illusory to seek to identify a population with no obstetric risk, for a batch of unpredictable serious complications may occur during any delivery and require substantial intervention that must, to have the best chance of success, be performed rapidly, in a matter of minutes. Supporters of a more "natural" delivery even suspect that displaced or unnecessary medical interventions may be the cause of some difficult situations [11].

In this work, we sought to study the chronology of the appearance of perpartum obstetric risk factors (POR) to define the best moment to evaluate the type of management to which women will be oriented. We have secondarily studied the extent to which inappropriate medical interventions play a role in the genesis of some complications in the deliveries of women who are in principle at low risk.

Material and methods

This prospective cohort study took place from January 1 to June 30, 2015 at the Croix-Rousse Hospital of Lyon, a level III maternity, and the Valence Hospital Center, a level II maternity, both with an adjacent demedicalized unit for physiological childbirth.

1. / Data collection (appendix 1)

The midwife or the obstetrician following the pregnancy of each women, collected the data during pregnancy. Then the midwife responsible for each woman at admission for delivery completed the data about her. At the end, data about delivery were collected by the midwife or resident.

2. / Population (inclusion and exclusion criteria)

The study included all women giving birth at one of the participating hospitals at 24–42 weeks of gestation. It excluded non-hospital births, in utero fetal deaths, medical terminations of pregnancy, and planned cesareans.

3. / Assignment to groups

The risk factors were selected from a review of the literature [6,12–25] and are detailed in the Appendix (recto). They enabled us to divide the women into two groups: one at high perpartum obstetric risk (POR+), including women with one or more risk factors, and another with no known perpartum obstetric risk (POR-), comprising the women with no risk factors.

Membership in the POR- group was assessed during pregnancy and then again by the midwife managing the women in the delivery room at the onset of labor; it could be reassessed again at any point during labor. The appearance of a risk factor during the examination at admission or during labor in a woman previously POR- resulted in transferring her into the POR+ group.

Assignment to a group was carried out at three different points : in the last pregnancy monitoring consultation, at the onset of labor on admission to the delivery room, and at the end of labor just before expulsive efforts.

4. / Outcome measures

We observed medical interventions and foeto-maternal complications in each group as detailed in Table 1. A delivery for which no medical intervention was necessary and for which there were

neither maternal nor neonatal complications was defined as simple. A non-simple delivery was one involving a medical intervention, a maternal or neonatal complication, or any combination of these.

We compared the incidence of non-simple deliveries between the two groups defined at three time points: the end of the pregnancy, the onset of labor, and the end of labor as previously defined. The incidence of intrapartum interventions and complications were also assessed as a function of the presence (or absence) of each risk factor.

5. / Second retrospective analysis

We analyzed the practices and management for women initially considered POR- at the onset of labor but who had a non-simple delivery to assess adherence to current guidelines [26–32] and to assess whether some non-simple deliveries were associated with inappropriate management or over-medicalization. This retrospective relevance review was conducted with an audit schedule for reviewing clinical data reported from medical records.

3. /Statistics

The statistical analyses were performed with Excel stat and BiostaTGV software. We calculated relative risks with their 95% confidence intervals for the relation of unfavorable or unexpected outcomes to POR- compared with POR+ women. Means were compared with Student's t-test and percentages with a Chi 2 test; the alpha risk was set at 5%.

Results

Overall 1975 women were included in the study : 1109 at Croix Rousse Hospital in Lyon and 866 in Valence (Fig. 1). The results did not differ significantly between the two hospitals.

The women's mean age was 30 years (+/-5), and the mean birth weight 3254 g (+/−186 g). The global rate of non-simple deliveries (all risk levels combined) was 36%, with 13% of the women having cesareans and 11% operative vaginal deliveries.

Fig. 1 presents the distribution of women in the two groups (POR+ and POR-) at each stage of the POR reassessment.

The principal risk factors identified during pregnancy were nulliparity (44%), previous cesarean (7.8%), twin pregnancy (2.9%), suspected fetal macrosomia (2.6%), oligohydramnios (2.0%), preeclampsia (1.8%), diagnosis of small-for-gestational size (SGA) or fetal growth restriction (FGR) (1.8%), breech presentation (1.6%), and polyhydramnios (0.5%).

Nulliparity increased the risk of non-simple delivery by a factor of 1.8 (48% versus 27%, 95%CI [1.6–2.0]). Thus nulliparas were 1.8 times more likely to have a cesarean (17% versus 10%, 95%CI [1.4–2.2]), 5.4 times more likely to have an operative vaginal delivery (21% versus 4%, 95%CI [3.9–7.4]), and 4.5 times more likely to have 3rd or 4th degree perineal lacerations (3% versus 1%, 95%CI [2.0–10.4]) than parous women. Their risk of having a child with a 3-min Apgar score <7 was 2.2 times greater (5% versus 2%, 95%CI [1.3–3.6]), a child requiring mechanical ventilation 3.4 times greater (2% versus 1%, 95%CI [1.2–8.1]) and a child transferred to a NICU or special care unit, 2.1 times greater (3% versus 1%, 95%CI [1.1–4.0]).

A uterine scar was associated with a significantly higher risk of cesarean delivery during labor (37% versus 11%, RR 3.4, 95%CI [2.7–4.3]) and of manual uterine examination (excluding women with PPH) (17% versus 7%, RR 2.5, 95%CI [1.7–3.8]).

One uterine rupture was reported for a nullipara without any previous cesarean and with no other uterine scar. She only had signs of superficial endometriosis that could have explained this complication.

Table 1
Medical interventions or maternal or fetal complications in the POR- and P+ groups at the end of pregnancy, onset of labor, and end of labor.

	At the end of pregnancy			At the onset of labor			At the end of labor		
	POR- at the end of pregnancy n (%)	POR + at the end of pregnancy n (%)	RR [95% CI]	POR- at the onset of labor n (%)	POR + at the onset of labor n (%)	RR [95% CI]	POR- at the end of labor n (%)	POR + at the end of labor n (%)	RR [95%CI]
Maternal complications or medical interventions	109 (17.0%)	591 (44.0%)	2.6 [2.2 ; 3.1]	66 (16.0%)	634 (41.9%)	2.6 [2.1 ; 3.3]	52 (13.1%)	648 (41.1%)	3.1 [2.4 ; 4.1]
Manual revision (excluding for PPH)	42 (6.6%)	105 (7.7%)	1.2 [0.8 ; 1.7]	28 (6.6%)	119 (7.7%)	1.2 [0.8 ; 1.7]	25 (6.3%)	122 (7.7%)	1.2 [0.8 ; 1.9]
PPH	37 (5.8%)	135 (10.0%)	1.7 [1.2 ; 2.5]	19 (4.5%)	153 (9.9%)	2.2 [1.4 ; 3.5]	17 (4.3%)	155 (9.8%)	2.3 [1.4 ; 3.7]
Sulprostone	4 (0.6%)	29 (2.2%)	3.5 [1.2 ; 9.8]	0	33 (2.1%)	NA	0	33 (2.1%)	NA
Embolization	0	1 (0.1%)	NA	0	1 (0.1%)	NA	0	1 (0.1%)	NA
Bakri balloon	1 (0.2%)	3 (0.2%)	1.4 [0.1 ; 13.7]	0	4 (0.3%)	NA	0	4 (0.3%)	NA
Surgery or emergency hysterectomy	0	0	NA	0	0	NA	0	0	NA
Cesareans	18 (2.8%)	237 (17.7%)	6.3 [3.9 ; 10.1]	7 (1.7%)	248 (16.0%)	9.7 [4.6 ; 20.4]	2 (0.5%)	253 (16.0%)	31.8 [8.0 ; 127.4]
Cesarean, code green DTDT ≤ 60 min	13 (2%)	163 (12.2%)	6.0 [3.4 ; 10.4]	4 (0.9%)	172 (11.1%)	11.8 [4.4 ; 31.5]	1 (0.3%)	175 (11.1%)	44.0 [6.2 ; 313.3]
Cesarean, code orange DTDT ≤ 30 min	3 (0.5%)	50 (3.7%)	8.0 [2.5 ; 25.4]	1 (0.2%)	52 (3.4%)	14.2 [2.0 ; 102.5]	0	53 (3.4%)	NA
Cesarean, code red DTDT ≤ 15 min	2 (0.3%)	24 (1.8%)	5.7 [1.4 ; 24.2]	2 (0.5%)	24 (1.5%)	3.3 [0.8 ; 13.8]	1 (0.3%)	25 (1.6%)	6.3 [0.9 ; 46.3]
Operative vaginal deliveries	18 (2.8%)	207 (15.5%)	5.5 [3.4 ; 8.8]	14 (3.3%)	211 (13.6%)	4.1 [2.4 ; 7.0]	8 (2.0%)	217 (13.8%)	6.8 [3.4 ; 13.7]
Perineal laceration 3rd or 4th degree	2 (0.3%)	30 (2.2%)	7.2 [1.7 ; 29.9]	1 (0.2%)	31 (2.0%)	8.5 [1.2 ; 61.9]	0	32 (2.0%)	NA
Shoulder dystocia	6 (0.9%)	21 (1.6%)	1.7 [0.7 ; 4.1]	3 (0.7%)	24 (1.5%)	2.2 [0.7 ; 7.2]	2 (0.5%)	25 (1.6%)	3.1 [0.7 ; 13.2]
Maternal transfer to ICU	0	0	NA	0	0	NA	0	0	NA
Neonatal complications	7 (1.1%)	55 (4.0%)	3.6 [1.7 ; 7.9]	2 (0.5%)	60 (3.7%)	7.9 [1.9 ; 32.3]	2 (0.5%)	60 (3.7%)	7.3 [1.8 ; 29.8]
Apgar< 7 at 5 min	2 (0.3%)	15 (1.1%)	3.4 [0.8 ; 15.0]	1 (0.2%)	17 (1.1%)	4.5 [0.6 ; 33.7]	0	17 (1.0%)	NA
pH<7	1 (0.2%)	6 (0.4%)	2.8 [0.3 ; 22.8]	1 (0.2%)	6 (0.4%)	1.6 [0.2 ; 13.1]	1 (0.3%)	6 (0.4%)	1.5 [0.2 ; 12.1]
Intubation	2 (0.3%)	23 (1.7%)	5.3 [1.2 ; 22.3]	0	25 (1.6%)	NA	0	25 (1.5%)	NA
Neonatal intensive care or special neonatal care unit	4 (0.6%)	36 (2.6%)	4.1 [1.5 ; 11.6]	1 (0.2%)	39 (1.6%)	10.3 [1.4 ; 74.9]	1 (0.3%)	39 (2.4%)	9.5 [1.3 ; 68.9]
Neonatal death	1 (0.2%)	2 (0.1%)	0.9 [0.1 ; 10.1]	0	3 (0.2%)	NA	0	3 (0.2%)	NA
NON-SIMPLE DELIVERY	**115 (18.0%)**	**603 (45.1%)**	**2.5 [2.1 ; 3.0]**	**68 (16.0%)**	**650 (41.9%)**	**2.6 [2.1 ; 3.3]**	**54 (13.6%)**	**664 (42.1%)**	**3.1 [2.4 ; 4.0]**

Of the woman classified POR- at the end of pregnancy, 18% had non-simple deliveries (Table 1).

The supplementary risk factors appearing most frequently on examination at admission for delivery were prolonged pregnancy (gestational age > 41 weeks) (17%), induction of labor by oxytocin (Syntocinon) (11%), preterm rupture of the membranes more than 24 h before (8%), preterm delivery (gestational age < 37 weeks) (7%), induction of labor by prostaglandin E2 (dinoprostone, specifically Prostine vaginal gel) (5%), fetal heart rate abnormalities at risk of acidosis defined according to the Aurore protocol [32], (4%), hypertension (3%), proteinuria (2%), fundal height > 36 cm (1.5%), significant bleeding (1.4%), and meconium staining (0.8%).
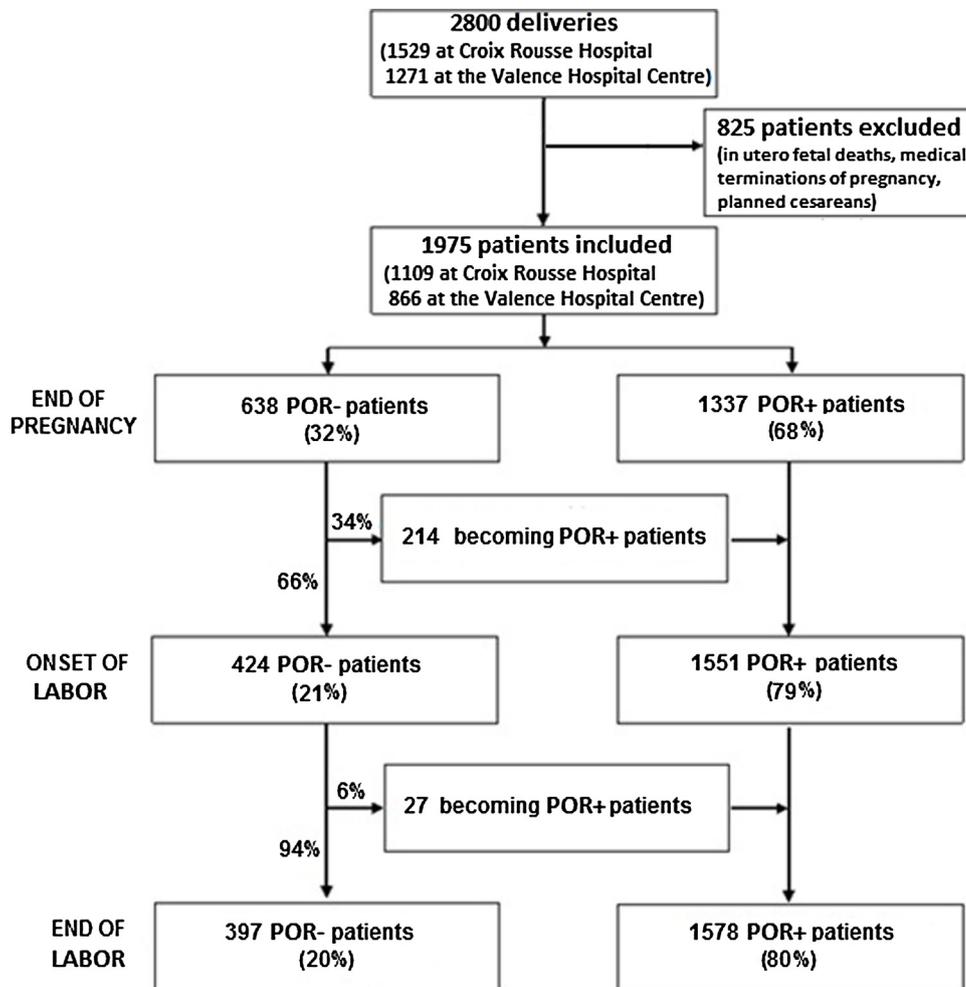
Fig. 1. Flow chart Distribution of women according to time period and risk level.

Among the women who were POR- at the onset of labor, 16% had a non-simple delivery compared with 42% of the POR + women (RR 2.6, 95%CI [2.1–3.0]) (Table 1).

The most frequent supplementary risk factors during labor were FHR abnormalities at risk of acidosis (10%) [32], lack of progress in dilation (4%), meconium staining during labor (1.6%), hypertension (0.6%), and hyperthermia during labor (0.4%).

Of the women who were POR- at the onset of labor, 6% became POR + by its end, mainly because of fetal heart rate abnormalities creating a risk of acidosis (67%) or a lack of progress in dilation (27%).

Of the 397 (20%) women POR- at the end of labor, 14% had a non-simple delivery (Table 1).

One woman who was POR- until the end of labor just before expulsive efforts, required an extremely urgent cesarean (code red, decision-to-delivery interval: 15 min, [33]) for failure of the operative vaginal delivery. Other code red cesareans were for POR + women at the end of labor.

The incidence rates of shoulder dystocia and of manual uterine examination for complete or partial placental retention did not differ significantly between our POR + and POR- groups at any of the three time points (Table 1).

Overall, 68 of the 424 women defined as POR- at the onset of labor had non-simple deliveries. A review of these 68 women's patient records showed that 11 (16%) had been misclassified : they had in fact had one or more risk factors at admission for delivery that should have initially classified them as POR+ (prolonged pregnancy, uterine scar, suspected macrosomia, history of postpartum hemorrhage, gestational diabetes treated by diet, and pregnancy-related hypertension).

A detailed analysis of the files of the 57 women correctly classified as POR- at the onset of labor found that compliance with current French guidelines for delivery would have resulted in better care and perhaps better outcomes for 20 of them (35%):

- Eight did not receive preventive oxytocin and had either a postpartum hemorrhage (PPH) (4) or manual removal of the placenta (4), which might have been prevented by that treatment [29].
- Three had manual removal of the placenta for bleeding perhaps because they had received oxytocin during labor that did not comply with guidelines (no justified indication and/or failure to follow dosing modalities — doses and dose-increments [27]).
- After inadvertent traction resulting in rupture of the placental cord, one woman underwent manual placental removal and had a PPH [29].
- Three women had an episiotomy as the only identified cause of their PPH [26].
- Five had an operative vaginal delivery for lack of progress in a posterior position, but manual rotation was not attempted during labor [30]. One of these 5 operative deliveries resulted in a code red cesarean when it failed.

Finally, 37 of these 57 women (65%) had non-simple deliveries that appeared both unpredictable and inevitable, after their clinical records were reviewes according to an audit schedule.

Discussion

Management in demedicalized facilities cannot be offered to all pregnant women or all births. The decision must rely above all else on the woman's informed decision and on rigorous selection to exclude all at-risk situations from the onset. Patient selection and guidelines to define the risk factors and eligibility criteria for this type of delivery are essential for safe childbirth [34].

Our study included 1975 women: 21% were POR- at the onset of labor. The different cohorts in the literature [14–18] report a proportion of women at low risk ranging from 38% to 65%, depending on the risk factors considered and the timing of the assessment.

Our prospective study included a sizable sample and thus enabled us to encounter most of the risk factors, interventions, and maternal and neonatal complications. The risk factors that we selected in advance are for the most part associated with an increase in the risk of interventions and/or complications.

Nulliparity appears to be a risk factor per se. Other studies have already reported higher complication rates among nulliparous women [15]: increased rates of operative vaginal deliveries and of cesareans [19], of postpartum hemorrhage [20], third or fourth degree perineal tears or lacerations [21,35], unfavorable neonatal outcomes [36] and high transfer rates [19,37,38]. These rates indicate the importance of avoiding demedicalized management among nulliparas.

In our cohort, almost half the women assessed as POR- at end of pregnancy were reevaluated as POR + by the end of labor. It therefore seems difficult to match the concept of low-risk pregnancy with that of low-risk delivery. Risk can change at any time, and a woman at low risk at beginning of pregnancy can become "at risk" at any point during her pregnancy, labor, or delivery [9].

The prenatal identification of maternal or fetal risk factors and prognostic obstetric assessments make it possible to define a birth plan, at least tentatively, in advance. At admission for delivery, the examination of the mother and the assessment of fetal status, including monitoring of the fetal heart rate, make it possible to confirm the absence of a risk situation. This precise moment appears to be the best time to assess POR and determine whether a woman may, if she so desires, give birth in a demedicalized unit. This risk should be reassessed during labor to consider transfer toward a traditional obstetric delivery room if new risk factors are identified.

Of the women in our study who were POR- at the onset of labor, 6% became POR + by its end. The literature [18,34] reports rates of transfer to a hospital from a delivery planned at home or in a birth center that vary from 9.9% to 31.9%; the principal indications are a request for epidural anesthesia (57%) and a non-reassuring fetal status (18%).

We found an incidence of non-simple deliveries 2.6 times higher in the POR + group than in the POR- group at the onset of labor. Nonetheless, despite their lower risk of unexpected maternal and/or neonatal complications, this risk was nonetheless 16% among the POR- women (versus 42% in the POR + group). It is thus quite far from zero.

Danilack et al. found at least one complication for 29% of the low-risk pregnancies and 57% for those at high risk [14]. The interventions and complications among the low-risk women in the different studies are substantially similar to those in ours: cesareans (3.1–15.4%), operative vaginal deliveries (4.5–16.6%), manual uterine examination (excluding PPH) (10%), PPH (0.4–1.7%), third- and fourth-degree perineal lacerations (0.4%), 5-min Apgar scores < 7 (3.1–3.2%), arterial pH < 7 (0.3–1.15%) and special or intensive care for the baby (0.3–8.1%) [14,16–18].

We did not observe any cases involving emergency hysterectomy, cord prolapse, or maternal continuous or intensive care, all of which are rare adverse events. In our study, one uterine rupture was reported, astonishingly for a nullipara, thus, without any previous cesarean and with no other uterine scar. Selvi-Dogan et al. reported a similar event [16].

It appears difficult to anticipate either the occurrence of shoulder dystocia or the need for manual uterine examination for placental retention. It is thus important that midwives be trained to cope with these complications.

Our study took place in one level III and one level II maternity unit, both with an adjacent demedicalized unit for physiological childbirth. Some recruitment bias may nonetheless be present, since our study did not include any level I maternity unit or any birth center. The standard policy of referring women considered at risk during pregnancy to level II or III maternity units explains our high proportion of POR + women. The care and monitoring offered during labor may be biased by the habits of departments and staff used to providing care for women at risk. Le Ray et al. [39] found that the maternity ward organization (level of care, size, and public/private status) affected the level of medicalization of the delivery of nulliparas at low risk independently of other maternal and neonatal risk factors and that this organization might affect the outcome of labor and its possible complications [21,37,40–42].

While the development of techniques for monitoring pregnancy has enabled real progress in the area of childbirth safety, over-medicalization of physiological pregnancies with medical interventions sometimes performed too routinely (episiotomy), excess monitoring, and the misuse of therapeutic agents (oxytocin) during labor have consequences in terms of maternal, fetal, and neonatal morbidity and mortality and potentially iatrogenic effects [8,11,43,44,46]. Accordingly in our study we found that for 35% (20/57) of the low-risk women who had a non-simple delivery, better management of labor might have avoided this; this includes 7 (12%) with complications linked to an unjustified obstetric practice (misuse of oxytocin, episiotomy, or cord traction).

In a before/after survey, Brément et al. [47] studied the effects on maternal and perinatal outcomes of training professionals (midwives and obstetricians) for physiological deliveries. They documented a significant reduction in fetal heart rhythm abnormalities and an improvement in perineal status at delivery (fewer episiotomies and lacerations) and enhanced women's comfort during labor — all without any significant effect on neonatal cardiopulmonary adaptation.

National guidelines in Norway differentiate between low- and high-risk pregnancies and apply a special protocol for the management of labor of women at low risk, deliberately eliminating unnecessary interventions. A study [48] assessing the impact of this protocol showed a significant increase in the spontaneous vaginal delivery rate in nulliparas and a reduction in the use of oxytocin in parous women at low risk.

The number of women using epidural analgesia in our cohort was high (81% of POR- women). Women who wish to deliver in midwife-led birth centers would not have access to this type of analgesia. The findings of several studies that epidural anesthesia is associated with a higher rate of operative vaginal deliveries [49,50] must be taken into consideration in the interpretation and extrapolation of our results.

The studies evaluating deliveries in birth centers of women at low risk compared with traditional hospital deliveries globally find that woman at birth centers have more spontaneous vaginal deliveries (RR 1.05; 95%CI 1.03–1.07), fewer operative vaginal deliveries (RR 0.90; 95% CI0.83-0.97), less epidural and other local/regional analgesia (0.85; 95% CI0.78-0.92), fewer amniotomies (0.80; 95%CI 0.66-0.98),and fewer episiotomies (RR 0.84; 95% CI0.77-0.92) [41]. The results for perinatal morbidity and mortality, however, are divergent. Some have found an increase in perinatal morbidity and mortality for infants of women at low risk whose labor was supervised at a birth center, and this rate is still higher when transfer is required [36]. Others have not reported significant differences in unfavorable neonatal outcomes [52]. In this second study [52], the birth center was adjacent to the traditional maternity ward, with the duration for transfer only 5 min.

In their literature review, Zielinski et al. [34] noted that a long distance to the nearest hospital or delay in starting a transfer due to lack of integration in the healthcare system can contribute to possible unfavorable neonatal outcomes.

Women with deliveries initially planned as physiological in a birth center (an alongside or adjacent midwife-led unit) sometimes acquire risk factors during labor over time and must be referred for transfer to a standard (obstetric) maternity unit. For others, however, emergency interventions become immediately necessary and there is no time for a transfer. These include, for example, a code red cesarean (0.5% in POR- women at the onset of labor in our study), operative vaginal delivery (11.2%), maneuvers for shoulder dystocia (0.9%), and management of a postpartum hemorrhage (5.7%) requiring a manual uterine examination under anesthesia. It is therefore simultaneously necessary that the midwives be trained to act onsite in these emergency situations and that the time needed for transfer be minimal (birth centers alongside or adjacent to a traditional obstetrics unit) to limit maternal and perinatal morbidity and mortality.

Conclusion

It is difficult in obstetrics to determine and predict the women who may need supplementary resources in addition to usual obstetric and neonatal care. Women without prenatal risk factors and their newborns can have unexpected complications during delivery and postpartum. There are no women at zero risk of intervention.

Identification during pregnancy is not sufficient for the optimal selection of women at low intrapartum obstetric risk who could benefit most from more physiological management. This decision should be made at the moment of admission for delivery.

Nulliparity is a risk factor per se.

In the population estimated at low risk at the onset of labor, 16% will have a non-simple delivery (7% manual uterine examinations, 4% postpartum hemorrhages, 3% operative vaginal deliveries, 2% cesareans, and 1% shoulder dystocia).

Among them, nearly one third might perhaps have been avoided by closer adherence to current recommendations, which are based on studies with a high level of evidence (preventive oxytocin, reduction in routine episiotomies, more careful use of oxytocin during labor, use of second line monitoring methods, and management of posterior positions and of the second stage of labor).

Nonetheless it remains the case that 54% of these women may still have an unpredictable but inevitable non-simple delivery that in some cases may require an extremely rapid intervention. Delivery in demedicalized or physiological units should therefore not take place in isolated or distant free-standing facilities. It is imperative that rapid transfer during labor be possible, with obstetricians, anesthesiologists, and pediatricians available expeditiously. This can take place safely only if the midwife-led center is adjacent to or integrated with a standard obstetrics unit.

Training professionals in this physiological work and a specific management protocol for delivery of low-risk pregnancies (insistence on elimination of inappropriate treatment) also seem interesting for diminishing still further the rate of non-simple deliveries in all maternity units.

Appendix A.

Data collection form (Risk factors & Delivery)

Evaluation of risk factors on admission for delivery

G__ P___ (n. normal deliveries:__) N° delivery:__

Gestational Age: _____   Patient's Age:_____   Patient Label

History: Uterine scar (n° of cesareans =___)   Maternal Diseases

Shoulder dystocia	Renal	APS-systemic
Hist. perinatal asphysia or death	Cardiac/chest surg.	Hemoglobinopathy
Cause:_____)	Neurol/cerebral hemorrhage/aneurysm	HIV+
Prev. IUFD	Pulmonary/asthma	Graves disease
PPH	Cystic fibrosis	Preexisting diabetes
BMI ≥ 4O kg.m2	Chronic hyptertension	Other: specify_____
Height < 1,50 m	Venous thromboembolism/coag disorders	
Hist. back/pelvis traums		
Substance disorder (uses/stopped)		

Pregnancy:

Twin, triple or more	Oligohydramnios (<2)
Breech or other non-cephalic at term	Gestational diabetes diet insulin
Macrosomia (EFW ≥ 90° &/or AC ≥ 97° percentile	
Gestational hypertension	SGA/IUGR
Preeclampsia	Severe fetal malformation
Cholestasis of pregnancy	Fetal-maternal isoimmunization
Vomiting 2°/3° trimester	Polyhydramnios
Narrow pelvis	No prenatal care
Active maternal infection during pregnancy (hepatitis, HSV: recurrence < 10 days, primary infection <1 month	
Placental insertion anomaly (low insertion, suspected placenta accreta)	
Other:_____	

Risk Classification at Admission   **Low risk**   **Other**

Admission

<37 weeks	Blood pressure > 140/90
> 41 weeks	Proteinuria > 0.3 g/24 h or 2 ++
ROM < 34 wk >34 wk	Fundal height > 36 cm
Time from ROM & W = ___ h	Other:_____
Meconium staining	Abnormal fetal heart rate at start/Specify _____
Significant bleeding (red)	Induction: gel 1, gel 2, Propess, Balloon, oxytocin
Hyperthermia (> 38° twice an hour apart	Indication for induction: _____

Risk Classification at Onset of Labor   **Low Risk**   **Other**

Labor

Lack of progress of dilation	Bleeding
Blood pressure > 140/90	Hyperthermia (> 38° twice an hour apart)
Abnormal fetal heart rate: Specify _____	
Meconium staining	Other:_____

Risk Classification at the End of Labor   **Low Risk**   **Other**

Course and outcome of delivery

Epidural or other anesthesia
 Specify:_____
Abnormal fetal heart rate
 Specify:_____
Second line monitoring:
 Lactates, scalp pH, STAN
Cord prolapse
Uterine rupture
Planned cesarean
 Indication:_____
Cesarean code green
 Indication:_____
Cesarean code orange
 Indication
Cesarean code red
 Indication
Spontaneous vaginal delivery

Instrumental delivery (forceps, ventouse, spatula)
Indication:_____
Episiotomy
Tear/Laceration: 1st degree 2nd degree 3rd degree (A-B-C) 4th degree
Placenta delivery: Directed/non-directed Complete/incomplete

Manual uterine examination (for _____)
Blood loss (_____ cc)
PPH Sulprostone supplemental oxytocin embolisation, balloon,
surgery or hysterectomy for hemostasis
Anemia < 7 g/dl or symptomatic (Hb = _____)
Transfusion
Transfer to ICU

Other maternal complication (infection, VTE, cardiac arrest, amniotic
 embolism, death, other:_____

Child 1   sex weight pHa pHv

Apgar __/___/___/___
Meconium inhalation
Neonatal infection
Severe neurological lesions (anoxic/
 (ischemic encephalopathy, convulsions,
 meningitis, IVH 3rd or 4th degree,
 cystic leukomalacia)
Intubation during admission
Mechanical ventilation
NICU
Death
Other:_____

Child 2   sex weight pHa pHv

Apgar __/___/___/___
Meconium inhalation
Neonatal infection
Severe neurological lesions (anoxic/
 (ischemic encephalopathy, convulsions,
 meningitis, IVH 3rd or 4th degree,
 cystic leukomalacia)
Intubation during admission
Mechanical ventilation
NICU
Death
Other:_____

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