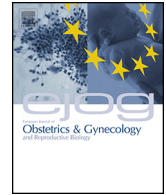




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# European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: [www.elsevier.com/locate/ejogrb](http://www.elsevier.com/locate/ejogrb)

## Frequency, causes and avoidability of outborn births in a French regional perinatal network



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### ARTICLE INFO

#### Article history:

Received 7 February 2014

Received in revised form 21 April 2014

Accepted 9 May 2014

#### Keywords:

Prematurity

Outborn

Inborn

Assessment

Perinatal network

### ABSTRACT

**Objectives:** To evaluate the rate and circumstances of outborn deliveries within a French perinatal network, and to determine their avoidability.

**Study design:** Cohort study including preterm infants <33 weeks gestation and/or weighing <1500 g born outside a level III maternity unit in Lower Normandy region, France, in 2008–2010. In 2008 and 2009, only neonates transferred to the Caen University Teaching Hospital (CHU) were included. In 2010, all outborn neonates in the region were included by means of a medical information system program. A panel of 7 experts was set up to determine the avoidability of each outborn case using a two-stage modified Delphi procedure. Inter-expert agreement was evaluated using the kappa index.

**Results:** Sixty-four cases (71 neonates) were included. The outborn rate in 2010 was 16.1% (40/248, 95% CI (116–207%)). The most common reason for delivery was spontaneous onset of labour (57.8%). In 12 cases, the place of birth (level 2b maternity unit) was considered to be appropriate by the experts (term  $\geq 32$  WG)

, but 8 cases involved infants of low birth weight (<1500 g). For the 52 cases born in inappropriate sites, 9.6% were considered to be avoidable (kappa index = 0.42 ( $p < 10^{-3}$ )).

**Conclusion:** Our outborn rate meets regionalisation targets. Our method of expert evaluation identified a small percentage of avoidable births in inappropriate sites. Regular reassessment of obstetric practices and good coordination between network actors are crucial to improve the management of pregnancies at risk of outborn delivery.

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### Introduction

The aim of regionalizing perinatal care is to organize the birth of those neonates who are most at risk, principally very preterm (VPT) and very low birth weight (VLBW) infants, in centers adapted

for their management by promoting in utero transfer (IUT). In 2008, the meta-analysis by Lasswell [1] pooling the results of more than 30 years of published studies once again showed that the risk of neonatal death was significantly higher for VPT and VLBW infants born outside a maternity unit of the appropriate level ("outborn" infants).

Regional organization of perinatal care developed in the 1970s in the United States with the publication of the report "Toward Improving the Outcome of Pregnancy" [2], which categorized maternity units into three levels and advocated the utility of in utero transfer.

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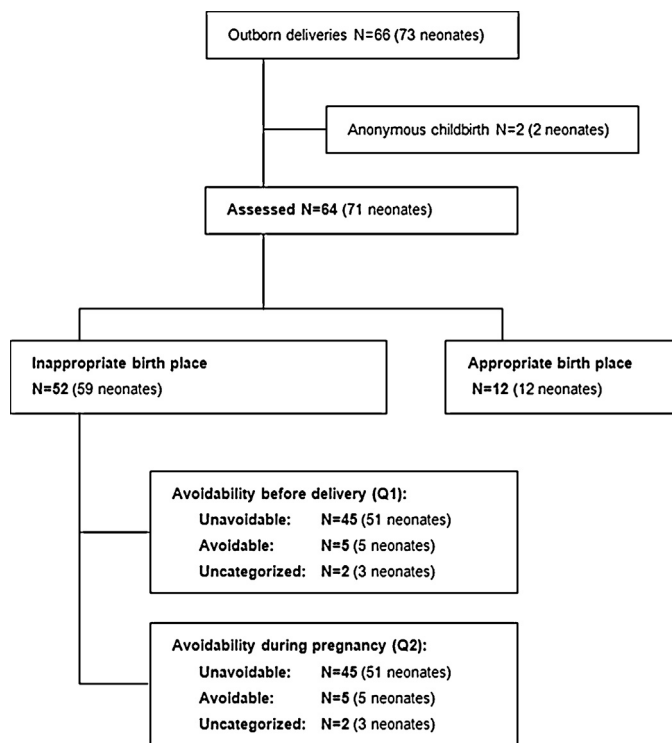


Fig. 1. Flow chart and assessment results.

**Table 1**  
Characteristics of mothers, pregnancies and neonates.

Characteristics	
Mothers (N = 64)	
Age, mean (SD) (years)	27.2 (5.7)
Gestational age, median (25th–75th percentile) (weeks)	31 (29–32)
Gravidity, N (%)	
1	22 (34.4)
2–4	35 (54.7)
≥5	7 (10.9)
Parity, N (%)	
1	25 (39.1)
2–4	34 (53.1)
≥5	5 (7.8)
History of miscarriage, N (%)	15 (23.4)
Previous obstetric pathology <sup>a</sup> , N (%)	12 (18.8)
Smoking during pregnancy, N (%) (missing: 12)	
No	21 (40.4)
<10/day	5 (9.6)
≥10/day	26 (50.0)
Working during pregnancy, N (%) (missing: 11)	28 (52.8)
Pregnancies (N = 64)	
Multiple pregnancy, N (%)	7 (10.9)
No consultation during pregnancy, N (%)	6 (9.4)
Obstetric pathology <sup>b</sup> , N (%)	23 (35.9)
Hospitalization during pregnancy, N (%)	21 (33.3)
Neonates (N = 71)	
Birthweight, mean (SD) (g)	1400 (359)
Severe complications during hospitalization, N (%) (N = 68)	
Death	7 (10.3)
Fetal heart rate abnormalities	2 (2.9)
Bronchopulmonary dysplasia	7 (10.3)
Necrotizing enterocolitis	1 (1.5)

<sup>a</sup> Fetal death, preterm birth, fetal malformation, uterine abnormality, fetal growth restriction, preeclampsia.

<sup>b</sup> Premature obstetric labor, fetal growth restriction, metrorrhagia, placental or uterine abnormality, preeclampsia.

**Table 2**  
Reasons for delivery and contraindications to in utero transfer.

	N	%
Reasons for delivery (N = 64)		
Spontaneous labor	37	57.8
Fetal growth restriction	8	12.5
Placenta abruptio	6	9.4
Pre-eclampsia (+HELLP)	5	7.8
Suspicion of chorioamnionitis	4	6.3
Severe bleedings	3	4.7
Fetal heart rate abnormalities	1	1.6
Contraindications to in utero transfer (N = 51)		
Risk of imminent delivery	36	70.6
Placenta abruptio (certain or suspected)	5	9.8
Severe fetal heart rate abnormalities	5	9.8
Praevia placenta hemorrhagic	3	5.9
Home delivery	2	3.9

Percentages may not add up to 100 due to rounding.

Little by little, this regionalisation policy spread to Europe, but it was only in the 1990s that its organization developed in France in response to the mediocre perinatal outcomes observed [3]. The first government decrees to make regionalisation and functioning perinatal networks obligatory in our country came into force in 1998.

In Lower Normandy region, France, a perinatal network was set up in 1999. One of its objectives was to organize in utero transfers at the regional level. Follow-up of the rate of infants born in a maternity unit appropriate to their management was one of the various indicators which allowed the network to be evaluated. This rate has been over 80% for several years [4], but a systematic review of cases of outborn births had, until the present study, not been conducted.

Our goals were to quantify outborn births, to identify their causes, and to assess their avoidability.

## Materials and methods

### Study population

The study population consisted of VLBW (<1500 g) and VPT infants (<33 WG) born outside of a level III hospital in lower Normandy, France. Lower Normandy is a region located in the northwestern part of France with 1,500,000 inhabitants and 17,000 annual births. Of the 15 maternity units of the region, 2 are located in level III hospitals, i.e. equipped to handle serious neonatal illnesses and abnormalities.

In 2008 and 2009, only children born outside of one of the two level III hospitals (Caen Regional University Hospital) were included. In 2010, we were able to include both level III maternities and outborn births that were not followed by a neonatal transport (hospitalization in the delivery hospital, or neonatal death before transport).

Children of gestational age less than 24 weeks gestation were excluded, as well as stillbirths, regardless of gestational age.

### Data source

The data source for identifying cases was hospital discharge data from the French medical information system program (PMSI). The PMSI routinely collects information about patient hospitalization, with regular cross-checks for consistency and completeness. For each identified case, medical records from maternity wards and neonatal units were consulted to collate additional information. Data collected included demographics (for mother and child), history of previous pregnancies, monitoring of the current pregnancy, antenatal and intrapartum care, and hospitalization of neonates.

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