




The “Cocoon,” first alongside midwifery-led unit within a Belgian hospital: Comparison of the maternal and neonatal outcomes with the standard obstetric unit over 2 years

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Abstract

Objectives: Our aim was to compare maternal and neonatal outcomes of women with a low-risk pregnancy attending the “Cocoon,” an alongside midwifery-led birth center and care pathway, with women with a low-risk pregnancy attending the traditional care pathway in a tertiary care hospital in Belgium.

Methods: We performed a retrospective cohort study of maternal and neonatal outcomes of women with a low-risk pregnancy who chose to adhere to the Cocoon pathway of care (n = 590) and women with a low-risk pregnancy who chose the traditional pathway of care (n = 394) from March 1, 2014, to February 29, 2016. We performed all analyses using an intention-to-treat approach.

Results: In this setting, the cesarean birth rate was 10.3% compared with 16.0% in the traditional care pathway (adjusted odds ratios [aOR] 0.42 [95% CI 0.25-0.69]), the induction rate was 16.3% compared with 30.5% (0.46 [0.30-0.69]), the epidural analgesia rate was 24.9% compared with 59.1% (0.15 [0.09-0.22]), and the episiotomy rate was 6.8% compared with 14.5% (0.31 [0.17-0.56]). There was no increase in adverse neonatal outcomes. Intrapartum and postpartum transfer rates to the traditional pathway of care were 21.1% and 7.1%, respectively.

Conclusions: Women planning their births in the midwifery-led unit, the Cocoon, experienced fewer interventions with no increase in adverse neonatal outcomes. Our study gives initial support for the introduction of similar midwifery-led care pathways in other hospitals in Belgium.

KEYWORDS

alongside midwifery-led birth unit, low-risk pregnancy, maternal outcomes, neonatal outcomes

Welffens, Derisbourg and Costa contributed equally to this work.

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1 | INTRODUCTION

A low-risk pregnancy is a pregnancy that remains uncomplicated in a healthy woman.¹ In many countries, both uncomplicated and complicated pregnancies were attended to similarly until the 1980s. This attitude led to an exaggerated medicalization of straightforward pregnancies and an increase in iatrogenic maternal morbidity.² Additional research has opened the possibility for a pathway of care adapted to uncomplicated pregnancies.³⁻⁶ In 2018, the World Health Organization (WHO) published new recommendations for intrapartum care to make childbirth a more positive experience and to encourage the minimization of interventions in healthy women.⁷ Midwives are experts in the care of normal pregnancies and births,⁸ and future parents benefit from a comprehensive management program administered by midwives through every stage of pregnancy, labor, delivery, and the postnatal period.^{9,10} Studies in several countries have shown that midwifery-led care and alternative birth places are associated with better maternal outcomes.^{2,5,11-13} Other studies have emphasized the importance of the proximity of a hospital in case of need.^{14,15} Midwifery-led birth centers within hospitals have been created, allowing for quick emergency interventions, thanks to the immediate availability of doctors and operating theaters.¹⁶

In 2014, the first Belgian alongside midwifery-led birth center, the “Cocoon” (“Cocon” in French), opened in the Erasme teaching hospital, located in Brussels. The aim was to offer women with low-risk pregnancies the choice of all-inclusive midwifery-led care within the safe and secure environment of a hospital. This pathway of care offers group sessions in addition to conventional prenatal consultations. It is geographically distinct from the traditional labor ward and possesses its own antenatal clinic, classes, and birth rooms, but it shares the same postpartum maternity ward. The birth center is led by a team of specialized midwives.

The purpose of our study is to compare maternal and neonatal outcomes between patients who chose the Cocoon pathway of care and those who chose the traditional pathway of care.

2 | METHODS

This is a retrospective cohort study that compares outcomes of low-risk pregnancies in the Cocoon and in the traditional pathway (inclusion and exclusion criteria are listed in Table 1). Patients who, upon review of their medical file, had a documented low-risk pregnancy were included from March 1, 2014, to February 29, 2016. During the first prenatal visit, women from both groups were questioned regarding their medical history in the same structured way and were excluded if they had a pre-existing medical condition, including

active infection, hematological problems, cardiac disease, pulmonary disease, neurological disease, autoimmune disease, pre-existing diabetes, endocrinological disease, or other significant past histories (Table 1). The same definition of a low-risk pregnancy was used for all. In some cases, the team of midwives and the physician in charge would discuss the eligibility of patients using the Cocoon pathway. Patients with corrected hypothyroidism or gestational diabetes without fetal macrosomia, for example, were regularly accepted (Table 1).

Patients who chose the Cocoon pathway had their pregnancy followed up almost exclusively by midwives, and their care was reviewed by a gynecologist at least twice during their pregnancy. The visits at the Cocoon lasted 45 minutes instead of the standard 20 minutes in the “classic” clinic. Throughout their pregnancies, women were able to familiarize themselves with the members of the Cocoon team. Women and their birth partners were encouraged to attend classes provided by midwives from the Cocoon and were given the opportunity to participate in a maximum of seven classes, six of which were group classes.

During labor within the Cocoon, women benefited from one-to-one care with a midwife from the team and a second midwife who attended the birth. In contrast, one-to-one care is not always possible in the traditional labor ward. Hydrotherapy was available in both settings and was more regularly used in the Cocoon, while epidurals were only available in the labor ward. The fetal heart rate was primarily assessed by intermittent auscultation in the Cocoon and primarily by continuous cardiotocography in the labor ward.

Transfer to the traditional labor ward was possible if a complication arose or if the woman requested an epidural (Table 2). Patients in the traditional pathway of care had their pregnancies followed up by both gynecologists and midwives. In the labor ward, births were attended by midwives or gynecologists.

For each woman, we collected the following data from the hospital electronic registration system: age, parity, level of education (“high and more” for the last three years of secondary school, high school and university and “low” for primary school and the first three years of secondary school), household income, origin (Europe for countries on the European continent, sub-Saharan Africa for the African countries South of the Sahara, and Mediterranean Basin for the countries around the Mediterranean Sea except France, Spain, Italy, and Greece), body mass index (BMI), and maternal outcomes, including: induction, epidural analgesia, cesarean birth, assisted vaginal delivery, perineal outcome (first- and second-degree tear, third- and fourth-degree tear, and episiotomy), postpartum hemorrhage (more than 500 mL), manual removal of placenta, postpartum stay (two days and less/three days and more), neonatal outcomes (5 min Apgar score (\geq or $<$ 7), and neonatal care transfer.

TABLE 1 Inclusion and exclusion criteria for the Cocoon pathway of care, Brussels, Belgium, 2014-2016

	Inclusion criteria	Criteria requiring discussion within the team	Exclusion criteria
Motivation for natural birth	Strong	Moderate	Poor
Communication (French)	Fluent	Intermediate	Beginner
Maternal age (years)	≥ 18 and ≤ 40	< 18 or > 40	≥ 45
Parity	0-4	5-6	≥ 7
Pre-pregnancy BMI (kg/m ²)	≥ 18 and < 30	≥ 30 and < 35	≥ 35 or < 18
Psychosocial problem		Domestic violence	
Substance abuse	No	Occasional marijuana use	Yes
Pre-existing maternal medical condition	No	Thyroid disease	Yes
Gynecological history		Female genital mutilation, sexually transmitted infection, fibroid	Myomectomy or hysterotomy
Obstetrical history		Mild pre-eclampsia In utero fetal demise known and non-recurrent cause Shoulder dystocia without sequelae Third- or fourth-degree tear Retained placenta and manual removal Postpartum hemorrhage (>500 mL) Previous cesarean birth with at least one subsequent vaginal birth Gestational diabetes Prematurity <34 wks Postpartum depression	Severe pre-eclampsia Eclampsia In utero fetal demise of unknown cause Neonatal group B streptococcus septicemia
Gestational age at the beginning of prenatal follow-up at the Cocoon (wks)	< 14	≥ 14 and < 32	≥ 32
Hb level at 36 wks (g/dL)	≥ 10	≥ 9 and < 10	< 9
Gestational diabetes		Gestational diabetes and no suspicion of fetal macrosomia	Gestational diabetes, poor glycaemic control or suspicion of fetal macrosomia
Active infection		Group B Streptococcus, Hepatitis B	Other
Pregnancy complication	No		Pre-eclampsia, induction or indication for a cesarean birth
Number of fetuses	1		2 or more
Presentation	Cephalic		Breech or transverse lie
Gestational age at labor onset (wks)	≥ 37 and < 42		< 37 and ≥ 42
Estimated fetal weight	Normal		< 3 rd centile at the last ultrasound or ≥ 4500 g

(Continues)

TABLE 1 (Continued)

	Inclusion criteria	Criteria requiring discussion within the team	Exclusion criteria
Fetal pathology	No	Minor abnormality (eg cleft lip and palate)	Major abnormality (eg chromosomal defect)
Placental abnormality	No		Yes
Amniotic fluid volume abnormality	No		Yes

2.1 | Statistics

Statistical analyses were performed using STATA version 12 (Stata Corp LP). As women who remain under the care of midwives throughout their pregnancy and birth are inherently less likely to experience interventions like induction or cesarean birth, compared with women who are transferred to the care of a physician, we performed all analyses using an intention-to-treat approach: Women remained in their initial group for the analyses. We used descriptive statistics to describe women in both pathways of care. We compared continuous variables using t tests or Mann-Whitney tests as appropriate and categorical variables using chi-square or Fisher's exact tests. We set an alpha of 0.05. We performed

TABLE 2 Intrapartum and postpartum transfer criteria, Cocoon pathway, Brussels, Belgium, 2014-2016

Intrapartum transfer criteria
Meconium-stained amniotic fluid without imminent birth
Analgesia request
Heavy vaginal bleeding or persistent vaginal bleeding
Non-cephalic fetal lie
Prolonged rupture of the membranes >12 h with no onset of labor if Bishop <7 (>18 h if Bishop ≥7)
Abnormality of the fetal cardiac rhythm
No further cervical dilation for more than 2 h and in active labor
Maternal fever (38°C for an hour) maternal sepsis
Hypertension
Pre-eclampsia
Cord Prolapse
Placental abruption
Fetal expulsion >2 h
No fetal head descent at full dilation (30 min maximum)
Other matters of concern
Postpartum transfer criteria
Postpartum hemorrhage
Retained placenta
Third- or fourth-degree tear
Cervical or vaginal laceration
Other matters of concern

a logistic regression to compute odds ratios (OR) and 95% confidence intervals (CI) of outcomes both crude and adjusted (aOR) for baseline characteristics: age, BMI, level of education, household income, region of origin, and parity. Age, BMI, and parity were included as continuous variables.

3 | RESULTS

Our cohort consisted of 984 patients with a low-risk pregnancy, recruited from March 1, 2014, to February 29, 2016. A total of 590 patients (60.0%) chose to adhere to the Cocoon pathway of care, and 394 patients (40.0%) oriented themselves to the traditional pathway of care.

The women who chose the Cocoon pathway of care were most often older, with a normal BMI (>18.5 and <25 kg/m²), with a higher level of education, with two incomes in the household, from European countries, and expecting their first child (Table 3).

“Cocoon” patients were less likely to be induced (aOR 0.46 [95% CI 0.30-0.69]), to have an epidural analgesia (0.15 [0.09-0.22]), a cesarean birth (0.42 [0.25-0.69]), or an episiotomy (0.31 [0.17-0.56]) (Table 4). “Cocoon” patients also had a shorter stay in the hospital after delivery, with an aOR of 1.76 (1.23-2.51) for a postpartum hospital stay of two days or less (Table 4).

There was no statistically significant difference in the frequency of instrumental deliveries (0.77 [0.44-1.36]) or postpartum hemorrhage (1.26 [0.52-3.01]) between both pathways (Table 4).

There was no statistically significant difference in neonatal outcomes between the two groups (Apgar score and transfer to the neonatal intensive care unit) (Table 5).

Within the group of patients who chose the Cocoon pathway and started their labor there, the intrapartum transfer rate was 21.1% and the postpartum transfer rate was 7.1%.

The main reason for the intrapartum transfer was a patient's wish for an epidural analgesia (34.9%) (see Table 2 for the transfer criteria). Nulliparas were more likely to be transferred during labor (26.3%) than multiparas (14.1%) (OR 2.2 [95% CI 1.29-3.67] (*P* = .003).

Postpartum transfers were motivated by vaginal lacerations, third- or fourth-degree tears, hemorrhage (>500 mL),

TABLE 3 Sociodemographic characteristics of women in Cocoon and traditional pathways, Brussels, Belgium, 2014-2016 (n = 984). Differences are statistically significant for all variables ($P < .001$)

	Cocoon pathway (n = 590) n (%)	Traditional pathway (n = 394) n (%)
Maternal age (mean \pm SD)	31.9 \pm 0.2	29.8 \pm 0.3
<18	1 (0.2)	1 (0.2)
18-29	182 (30.8)	195 (49.5)
30-39	383 (64.9)	187 (47.5)
>39 years	24 (4.1)	11 (2.8)
Pre-pregnancy BMI (median, kg/m ²)	21.8	23.8
<18.5	33 (5.6)	7 (1.8)
18.5-24.9	430 (72.9)	221 (56.1)
25-29.9	72 (12.2)	108 (27.4)
>30	55 (9.3)	58 (14.7)
Level of education	n = 458	n = 385
High or more ^a	440 (96.1)	274 (71.2)
Low ^b	18 (3.9)	111 (28.8)
Household income	n = 459	n = 386
1 or less ^c	92 (20.0)	185 (47.9)
2 or more ^d	367 (80.0)	201 (52.1)
Origin	n = 457	n = 387
Europe	408 (89.3)	167 (43.1)
Sub-Saharan Africa	6 (1.3)	63 (16.3)
Mediterranean Basin (excluding European countries)	37 (8.1)	130 (33.6)
Other	6 (1.3)	27 (7.0)
Parity		
Nulliparous	367 (62.2)	176 (44.7)
Multiparous	223 (37.8)	218 (55.3)

^aFor the last three years of secondary school, high school and university.

^bFor primary school and the first three years of secondary school.

^cThere is no source of income or only one in the household.

^dThere are at least two sources of income in the household.

and retained placenta for 27.3%, 27.3%, 22.7%, and 22.7% of patients, respectively.

4 | DISCUSSION

In our analysis, we found that the “Cocoon” care pathway seems to be protective against induced labor, use of epidural analgesia, cesarean birth, and episiotomy. Only 10.3% of low-risk women under midwifery-led care had a cesarean birth, compared with 16.0% under physician-led care ($P < .001$).

Cocoon patients were more often of higher socioeconomic status (higher education and higher number of incomes per family, Table 3) than those who chose conventional care. This socioeconomic profile was also found in patients choosing midwifery-led care in Australia,¹⁷

Norway,¹⁸ and the United States.¹³ Women and couples seeking alternative pregnancy care, like the one offered at the Cocoon, are often well informed and give importance to their active participation during pregnancy care, labor, and delivery. In our study, we observed a higher percentage of nulliparous women choosing the Cocoon (Table 3). However, in The Netherlands, authors found more multiparous women in their group of women in midwifery-led care at onset of labor.¹¹

Regarding maternal outcomes, our results are in keeping with international literature and with a recent meta-analysis.¹⁹ This analysis included 15 randomized studies with a total of 17 674 patients. In patients who chose midwifery-led care, there were more spontaneous deliveries with a relative risk (RR) of 1.05 (95% CI 1.03-1.07), and the use of epidural analgesia was less frequent with a RR of 0.85 (95%

TABLE 4 Maternal outcomes of women in Cocoon and traditional pathways, Brussels, Belgium, 2014-2016

	Cocoon pathway n = 590 n (%)	Traditional pathway n = 394 n (%)	OR 95% CI	aOR ^a 95% CI
Induction	96 (16.3)	120 (30.5)	0.44 (0.33-0.60)**	0.46 (0.30-0.69)**
Epidural analgesia	147 (24.9)	233 (59.1)	0.23 (0.17-0.30)**	0.15 (0.09-0.22)**
Cesarean birth	61 (10.3)	63 (16.0)	0.61 (0.42-0.88)*	0.42 (0.25-0.69)***
Assisted vaginal delivery	48 (8.1)	42 (10.7)	0.74 (0.48-1.15)	0.77 (0.44-1.36)
Perineal outcome				
First- and second-degree laceration	249 (42.2)	141 (35.8)	1.17 (0.89-1.54)	1.11 (0.78-1.60)
Third- and fourth-degree laceration	10 (1.7)	3 (0.8)	2.2 (0.60-8.14)	4.47 (0.65-30.73)
Episiotomy	40 (6.8)	57 (14.5)	0.46 (0.29-0.73)**	0.31 (0.17-0.56)**
Postpartum Hemorrhage	26 (4.4)	12 (3.1)	1.47 (0.73-2.94)	1.26 (0.52-3.01)
Manual removal of the placenta	22 (4.2) ^b	9 (2.7) ^b	1.55 (0.71-3.41)	0.74 (0.28-1.94)
Postpartum stay of two days or less	261 (44.2)	122 (31.0)	1.77 (1.35-2.31)**	1.76 (1.23-2.51)*

^aAdjusted for age, BMI, parity, level of education, household income, and origin.

^bMissing data for the Cocoon pathway n = 61 and for the traditional pathway n = 63.

*P-value <.05; **P-value <.01; ***P-value <.001.

	Cocoon pathway n = 590 n (%)	Traditional pathway n = 394 n (%)	OR 95% CI	aOR ^a 95% CI
Apgar score at 5 min < 7	10 (1.7) ^b	11 (2.8) ^b	0.60 (0.25-1.42)	0.35 (0.12-1.03)
Neonatal care transfer	21 (3.6)	24 (6.1)	0.57 (0.31-1.04)	0.40 (0.19-0.88)*

^aAdjusted for age, BMI, parity, level of education, household income, and origin.

^bMissing data for the Cocoon n = 5 and the traditional pathway n = 4.

*P-value <.05.

TABLE 5 Neonatal outcomes in Cocoon and traditional pathways, Brussels, Belgium, 2014-2016

CI 0.78-0.92). The risks of having an artificial rupture of the membranes, instrumental birth, and an episiotomy were also lower, with RR of 0.80 (95% CI 0.6-0.98), 0.90 (95% CI 0.83-0.97), and 0.84 (95% CI 0.77-0.92), respectively. In this meta-analysis however, there was no statistically significant difference in the risk of induced labor or cesarean birth.¹⁹

The intrapartum transfer rate of the Cocoon women lies within the intermediate range. In the literature, transfer rates vary from 12%²⁰ to 31.3%.^{2,12,16,20-22} In their study of 16 710 patients, the Birthplace in England Collaborative Group found a transfer rate from an alongside midwifery unit of 21.2% before delivery.¹² Nulliparous women were more likely to be transferred from a non-obstetric unit setting to an obstetric unit (36 to 45%) than multiparous women (9%–13%).¹² In Norway, Bernitz et al found an intrapartum transfer rate of 28.4%.² The main reason for transfer was the need for an epidural analgesia (39.3%). In France, Gaudineau et al found a global transfer rate of 31.3%, with 56.6% of the women desiring an epidural

analgesia.¹⁶ In these studies, the proportions of nulliparous women were high at 67.5% and 44.9%. Despite one-to-one care, hydrotherapy, and massages, primiparous women are more likely to experience a longer labor than multiparous women and that may lead them to request more often locoregional analgesia. No pharmacological pain relief was available during the study period in the “Cocoon.” In an alongside midwifery-led unit in Ireland, Dencker et al found a lower transfer rate during labor and birth (14.6%) but only 31.1% of women were nullipara in their study. The reason for transfer was the woman's wish for epidural analgesia in only 15.1% of cases. The scope of practice of midwives is also different between countries. For example, a breech presentation or the need for induction of labor are indications for transfer of care in Belgium while they are not in the United States.²²

There is no reported increase in neonatal morbidity or mortality for newborns of women choosing an alongside midwifery-led unit that we could find in the

literature.^{2,12,23,24} In the large prospective English study, no difference was found in neonatal outcomes between births in a traditional labor ward and births in an alongside birthing center.¹² Our results are similarly reassuring regarding neonatal outcomes.

4.1 | Strengths and limitations

We have used an intention-to-treat approach: Women who were accepted in the “Cocoon” pathway of care were analyzed in that group even if their care had to be transferred to physician-led care. This approach minimizes the concern of overoptimistic estimates of the effect of the Cocoon pathway of care. However, this study is retrospective and observational, which are strong limitations. We have studied birth outcomes within the same hospital setting and among similar populations. However, women were not randomized to traditional versus midwifery-led care and have different characteristics. We have adjusted for several confounding factors, but unmeasured ones could have remained.

4.2 | Conclusions

The Cocoon is an innovative concept in Belgium, thanks to its location inside the walls of a hospital. Our results are very encouraging for low-risk women, who represent the majority of women in the pregnant Belgian population, and lay the groundwork for the creation of other midwifery-led structures across the country.

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