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Original article**Assessment of compliance with a color code protocol for non-elective cesarean section and its impact on time to delivery interval and neonatal outcomes.**

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Abstract

Introduction : We set out to assess the compliance with a cesarean section color code protocol and its impact on maternal and neonatal outcomes since its implementation in our maternity ward.

Methods: This was a retrospective study including a sample of 200 patients per year who underwent a non-elective cesarean section delivery in Rennes University Hospital from January 1, 2015 to December 31, 2018. Patients were grouped by year and by color code (red, orange or green). The main outcome was compliance with the protocol (color code in accordance with indication for cesarean section) and compliance with the corresponding decision-delivery interval. Secondary outcomes were maternal and neonatal outcomes.

Results: Eight hundred patients were included during the study period. There was no significant difference in patient characteristics over the years. There was a significant improvement in protocol compliance: full compliance increased from 22.4% in 2015 to 76.5% in 2018 ($p < 0.0001$). The respect of the 15 minutes decision-delivery interval in red code protocol increased between 2015 and 2018 ($p = 0.0020$).

Conclusion: We observed a significant improvement in compliance with the color code protocol between 2015 and 2018 and in the 15-minute decision-delivery deadline for the red code.

Keywords : Cesarean section ; color code protocol ; decision-to-delivery interval ; timeframe ; maternal outcomes ; neonatal outcomes.

Introduction

Cesarean section is one of the most frequent surgical procedures performed in the world and represents 21.4% of all births in France in 2021[1,2]. Emergency cesarean sections may occur in different clinical situations with varying degrees of emergency[3]. Many studies have tried to find the acceptable time frame for an emergency cesarean section, but there is no international consensus to date[4]. Some national multidisciplinary guidelines advocate an acceptable decision-delivery interval, such as in the United Kingdom or Germany[5,6].

In France, Dupuis et al. developed a tool to classify emergency cesarean sections in 2000[7]. This tool is based on medical indications identified by Lucas et al and includes three color code categories [3,8]:

- **Green:** Non-urgent cesarean section with a decision-delivery interval ≤ 1 hour.
- **Orange:** Urgent cesarean section with a decision-delivery interval ≤ 30 minutes.
- **Red:** Cesarean section to be performed in extreme emergency with a decision-delivery ≤ 15 minutes.

The aim of this study was to evaluate compliance with the color code protocol in terms of indication and decision-delivery intervals since its implementation in our maternity ward in 2014, and its impact on maternal and fetal outcomes.

Methods

Design of the study

This was a single-center retrospective study conducted in the maternity unit of Rennes University Hospital, France. This maternity unit is a tertiary maternofetal center with neonatal intensive care facilities and performs around 3700 deliveries per year, 19% of which are cesarean deliveries, and 13.5% non-elective cesarean sections.

Population

The patient inclusion period was from January 1, 2015 to December 31, 2018. The inclusion criteria were: women who underwent a non-elective cesarean section at >24 weeks of gestation, with no documented opposition to participate in research. Patients received a letter to inform them that their data would be collected and if they wanted, they could oppose to the data collection. The exclusion criteria were: patients undergoing elective cesarean section, women who were under legal protection. “A sample size of 200 patients per year was estimated to be enough to draw conclusions about our adherence to the protocol, considering a compliance from 20% in 2015 to 80% in 2018, and considering there were 4 groups (2015, 2016, 2017 and 2018). A random-draw was conducted to select 201 patients per year”.

Protocol

The obstetric team consists of five delivery room midwives, one obstetrician, two obstetric interns, one anesthetist and one anesthetist intern on site, and a pediatrician. The labor ward is composed of 14 delivery rooms and three operating theatres specifically designated for cesarean sections.

A written color code protocol according to Dupuis et al was introduced in our maternity ward during year 2014 (8). It defines indications for each color code, the decision-delivery interval for each color, and the role per color code of each member of the team. The **green** code corresponds to non-urgent cesarean section with a decision-delivery interval ≤ 1 hour (labor arrest ; labor induction failure) ; **orange** corresponds to urgent cesarean sections with a decision-delivery interval ≤ 30 minutes (failed instrumental delivery, fetal heart rate abnormalities) and **red** code is used only when cesarean sections have to be performed in extreme emergency with a decision-delivery interval ≤ 15 minutes (cord prolapse, fetal bradycardia ; suspicion of placental abruption or uterine rupture, or profuse placental hemorrhage). If another issue come out, not included in the protocol, the obstetrician is free to grade the color according to his beliefs and deliver the baby in the corresponding time.

Data collected

The data were collected from medical digital files via DxCare® software, using the keywords "cesarean section during labor - laparotomy" and "emergency cesarean section except labor- laparotomy" and, if necessary, from paper files including the partogram.

The clinical data collected were: maternal age, pre-pregnancy body mass index (BMI) [weight in kg/size² in metres], gravidity, parity, uni- or multi-scarred uterus. Obstetric data collected were: gestational complications and their type, type of pregnancy (single or multiple), occurrence of fetal death in utero or therapeutic termination of pregnancy, gestational age at which cesarean section was performed, occurrence during labor, and labor induction. Peroperative data comprised: incision time, the surgical technique used, possible presence of surgical difficulties, the occurrence of postpartum hemorrhage (defined by the presence of blood loss >500 mL), total peroperative blood loss (quantitative measurement), and surgery duration. The following data on anesthesia were also collected: epidural anesthesia administered prior to

cesarean section, type of anesthesia performed during the cesarean section, any changes in anesthesia during cesarean section and their reasons.

Neonatal data collected included: birth weight, sex of child, arterial pH and arterial lactates collected from the cord after birth, Apgar score at 1, 5 and 10 minutes, the need for neonatal resuscitation, the need for hospitalization in the neonatal unit including the reason and duration, and the occurrence of a neonatal death. Post-operative maternal data collected were: length of stay, maternal postpartum anemia (defined by hemoglobinemia below 11 g/dL), the need for transfusion, maternal complications and their type (venous thromboembolic event, surgical site infection, hemorrhagic complication, digestive or bladder), and the need for surgery.

To assess protocol compliance the color code indicated by the on-call obstetrician was noted for each patient, as well as the indication for the cesarean section mentioned in the cesarean section report. Based on this information, we checked that the color code was in line with the indication according to the protocol. We also noted any lack of mention of a color code in the file. In the event of non-compliance with the protocol or the absence of mention of a color code, we allocated a code according to the indication noted on the operational report. The decision-delivery interval was calculated by calculating the time between the decision to perform a cesarean section and the time of delivery. Compliance with the decision-delivery interval was verified according to the color code used by the on-call team.

Primary outcome

The primary outcome was compliance with the protocol, i.e. the use of the appropriate color code for the indication of cesarean section and compliance with the decision-delivery interval imposed by the protocol.

Four situations were identified in the event of non-compliance with the protocol:

- Color code used did not correspond to that proposed by the protocol for a given indication.
- Decision-delivery interval greater than that indicated in the protocol.
- Simultaneous presence of the two situations mentioned above (total non-compliance with protocol)
- No mention of a color code or time of decision in the medical file, whether computerized or paper ("missing data" group).

Based on these five situations, we categorized patients into five categories to make it easier to read the results:

- Category 1: Full compliance with protocol
- Category 2: Decision-delivery interval greater than that indicated by the protocol
- Category 3: The color code used did not match that provided by the protocol
- Category 4: Non-compliance with the protocol in both cases (inappropriate color code and decision-delivery interval greater than the maximum time imposed by the protocol)
- Category 5: Missing data (decision time and/or color code not mentioned in medical record)

Statistical analysis

Quantitative variables are described as follows: N, mean - standard deviation, minimum - Q1 - median - Q3 - maximum. For qualitative variables, the effective (N) and the percentage (%) are presented for each modality. To compare the different populations (years 2015, 2016, 2017 and 2018), the following statistical tests were used: Fisher (F) test for qualitative parameters and Kruskal-Wallis (KW) test for quantitative parameters. In case of $p < 0.05$, 2 to 2 tests with a correction of the threshold of significance according to the method of Bonferroni (for Fisher) or Dwass, Steel, Critchlow-Fligner (for Kruskal-Wallis) were carried out. The analyses were carried out with the SAS software, version 9.4.

Ethics

The local ethics committee approved the study (Reference: 20.119).

Results

A total of 1 971 patients underwent a non-elective cesarean section between January 1, 2015 and December 31, 2018. Of these, 201 patients were randomly selected for each year, corresponding to 800 patients included in the study (four patients excluded due to missing files). The details of patient selection can be seen in the patient flow chart (**Figure 1**).

Population Characteristics

Table 1 presents the characteristics of the overall population and per year. There was no significant difference between the years except for primiparity, a history of scarred uterus, and cesarean section during labor. Overall, 250 of the 800 cesarean sections were coded green (31.3%), 263 orange (32.9%), and 85 red (10.6%). For 202 patients (25.3%), the color code was missing from the medical record, whether computerized or paper. Between 2015 and 2018, the number of patients for whom a color code was not mentioned in the file decreased significantly ($p < 0.0001$). These were mainly for green and orange code cesarean sections, for which the number increased significantly over the years ($p < 0.0001$), as presented in **Table 1**. Conversely, there was no significant difference over time in the number of red code cesarean sections.

Results on the primary outcome

Between 2015 and 2018, there was a significant decrease in patients with missing data ($p < 0.0001$) and a significant improvement in full compliance with the protocol ($p < 0.0001$).

For patients for whom the color code was inappropriate (patients belonging to categories 3 and 4, i.e. 69 patients in total), 15.9% were under-evaluated according to the clinical situation (reassessed color code required faster management). **Figure 2** shows how compliance with the protocol changed from 2015 to 2018. The color chosen by the obstetrician was correct in 96.0%

of the green codes, 82.5% of the orange codes, and 80.2% of the red codes. There was significant agreement between the initial color code and the re-evaluated color code for each of the 3 color codes with a global Kappa match test of 0.82 (0.79 - 0.87).

Table 2 presents the mean decision-delivery interval based on the color code and year. There was no significant difference between the years on the decision-delivery interval regardless of the color code used. The rate of compliance of red code cesarean sections (with a decision-delivery interval of ≤ 15 mins) was 85.9% and increased significantly over the years to 100% in 2018 ($p = 0.0020$).

Most of the missing data was for color code only (83.6% of patients). For these patients, the decision-delivery interval was met for 73.7% after re-evaluation of the color code (using the indication noted on the operating report). When the decision-delivery interval was missing but the color code present, the color code was in line with the indication for 69.2% of the patients.

Outcomes of red code cesarean sections

Over the study period, 86 patients received a red code cesarean section for the following indications: fetal bradycardia (33 patients, i.e. 38.4%), fetal heart rhythm abnormalities (16 patients, i.e. 18.6%), retro-placental hematoma (13 patients, i.e. 15.1%), cord prolapse (10 patients, i.e. 11.6%), failure of instrumental extraction with fetal heart rhythm abnormalities (6 patients, i.e. 7%), uterine rupture (4 patients, i.e. 4.7%), Benckiser hemorrhage (1 patient, i.e. 1.2%), other indications (2 patients, i.e. 2.3%).

Most of the red code cesarean sections were therefore performed for actual red code indications. However, 17 patients (19.8%) received a red code cesarean section while the indication corresponded to a different code: 16 patients with an indication corresponding to an orange code, and one patient with an indication corresponding to a green code (forehead presentation

for a first twin). One patient had an indication not mentioned in the protocol (cervical retraction after birth of first twin).

Data on red code cesarean sections are presented in **Table 3**. The mean decision-delivery interval decreased over the years without reaching significance (from 13.6 ± 5 min to 11.0 ± 2.2 min, $p=0.05$). There was a significant improvement in the compliance with the 15-minutes decision-delivery interval imposed by the protocol, reaching a 100% compliance in 2018 ($p = 0.0020$).

Neonatal Results

Neonatal results are presented in **Table 4**. Arterial pH was missing for 54 newborns and therefore not included in the arterial pH results.

There was a significant increase in mean pH at birth over the years ($p = 0.0114$) but no significant difference in the number of infants with an arterial pH <7 . Eight neonatal deaths were recorded: five newborns died from severe complications linked to prematurity (necrotizing enterocolitis or severe bronchopulmonary dysplasia); three of complications related to neonatal acidosis; two of complications related to severe sepsis due to an intrauterine infection; and one of malformations in relation to maternal type 1 diabetes.

Maternal Complications

Maternal complications are presented in **Table 4**. Total operating blood loss was 434.7 ± 322 mL. The mean surgery duration was 41.2 ± 14.1 minutes. The overall postpartum hemorrhage rate was 36.4%, and 9.1% cases of postpartum hemorrhage over 1L were noted. There was no significant difference over the years in the rate of postpartum hemorrhage, whether severe or not. Five per cent of patients received a transfusion (globular or platelet). The mean

length of hospitalization was 6.3 ± 2.7 nights. The rate of post-operative infection was 3% with no significant difference between years. The surgical revision rate was 1.5%. Only one patient had a venous thromboembolic complication consisting of a pulmonary embolism.

Anesthesia Results

Red codes were mostly done under general anesthesia (n=57, 66.2%) or epidural anesthesia when it was already on the patient (n=28, 32.6%) and spinal anesthesia were sparse (n=1, 1.2%). On the contrary, green and orange codes were mostly under locoregional anesthesia, and rarely under general anesthesia (n=6 (2.4%) and n=14 (5.3%) respectively).

There was no significant difference in the number of conversions to general anesthesia in the color code groups (from 8.4% for green codes to 10.5% for red codes, $p=0.3$). Lack of analgesia was the main reason for conversion to general anesthesia (61 patients, i.e. 85.9%). Four patients received general anesthesia due to hemodynamic instability during cesarean section (occurrence of a uterine artery injury). Four patients developed a complication of epidural anesthesia requiring general anesthesia. Two patients underwent general anesthesia after failure of epidural anesthesia.

Discussion

Principal findings

Full compliance with a color code protocol for non-elective cesarean sections improved significantly between 2015 and 2018 in our maternity ward to reach a rate of 76.5% in 2018 ($p < 0.0001$) and 100% for red codes. There was also a significant decrease in the number patients with missing data in their medical records, with only 3.5% of data missing in 2018 compared to almost 27% in 2015 ($p < 0.0001$).

Results in the context of what is known

Several studies have studied the clinical impact of this color code protocol on the decision-delivery interval since its introduction in 2014. They have shown that color coding optimizes the organization and communication in the team regardless of the type of structure[9–13]. Indeed, in the absence of a protocol, it is difficult to meet the recommended decision-delivery intervals.

Clinical implications

Red codes time to delivery delay of 15 minutes might appear very short and is not recommended by other guidelines[5]. However, we observed a significant increase in compliance with the protocol for red code cesarean sections to reach full compliance in 2018 ($p = 0.0020$). The mean decision to delivery interval in 2018 for red codes reached 11 ± 2.2 minutes. Most of the red codes were under general anesthesia (66.2% in the four years). However, it is also possible to perform a red code under epidural, adapting epidural shortly after the decision.

About orange codes, 13 out of 72 (18%) of orange codes in 2018 were out of delay. Three of them are because of surgical difficulties, one because of long patient transportation, two because of anesthesia difficulties. For the seven others, the decision to delivery interval was 31

or 32 minutes. The mean decision to delivery interval for orange code cases with non-compliance was 38+-8 minutes.

Despite better compliance with the decision-delivery interval imposed by the protocol, there was no significant difference in neonatal morbidity over the years. The study was not powered to demonstrate this point. Even if a trend toward improve neonatal outcomes was observed, it is impossible to show it is related to the adherence to the protocol. A literature review by Pierre et al. reported that the pathology leading to emergency cesarean section may outweigh the neonatal prognosis over the adherence to a short decision-delivery interval[14]. The implementation of this protocol still shows a reduced number of missing data in the operative reports, which is crucial considering the importance of information tracing. Additionally, even if our study was not designed to address this point, no increase in maternal morbidity was noticed due to the rapid DDI in emergency situations.

Our study revealed that some indications of non-elective cesarean sections did not appear in the protocol. These non-protocol indications included preeclampsia, HELLP syndrome, intrauterine infection, and maternal shock, pathologies which do not necessarily require a cesarean section depending on the severity of the pathology. This underlines one of the limitations of the protocol in that a specific color code is not always adequate. It is important thus to remember that while such a protocol assists decision making in current practice, it is crucial to adapt management to each clinical situation for optimal outcome.

Research Implications

This study is a quality care and certification program to evaluate the communication code use in a team, to evaluate the traceability of the strategy and its consequences. It appears that it may be important to do this evaluation daily. Our protocol may enhance discussion with

a common language within a multidisciplinary team in an emergency situation, even if it is difficult to establish an ideal decision-to-delivery interval that is applicable to all teams. Communication inside the teams will be investigated in further studies.

Also, to improve protocol compliance, it would be interesting to study the elements that lead to non-compliance and thus improve our decision-delivery interval. In some studies, these elements appear to be the time between the decision to perform a cesarean section and entry into the operating room, organizational deficiencies, or anesthesia difficulties[14]. Protocol compliance could also be improved by team simulation training which has been shown to be effective in improving the management of many pathologies in obstetrics, especially when requiring coordinated teamwork[15–17].

Strengths and limitations

The main strength of our study is the large patient sample which ensures robustness of the results on the main judgment criterion. Our population of 800 patients undergoing non-elective cesarean section is one of the largest series studying color codes in this setting. On the other hand, a higher power would have been required to demonstrate the decrease in the rate of per-partum asphyxia following the implementation of the protocol. The main weakness of our study lies in its retrospective design implying the usual biases inherent to this type of study mainly due to missing data. It is more than possible that some data, such as the color code, were announced orally at the time of the cesarean section decision but not recorded in the medical records. A prospective study would help to overcome this bias and to assess current practices as accurately as possible.

Conclusion

We observed an improvement of full compliance with the color code protocol over the years (appropriate color code and decision-to-delivery interval). The implementation of such a protocol in our maternity also contributed to reduce missing data. The ensuing decrease in the rate of per-partum asphyxia remains to be demonstrated.

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Disclosure of interest

The authors report no conflict of interest.
Funding : None.

Ethics Approval

The local ethics committee approved the study (Reference: 20.119)

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Legends tables and figures

- Figures

Figure 1. Patients flow chart.

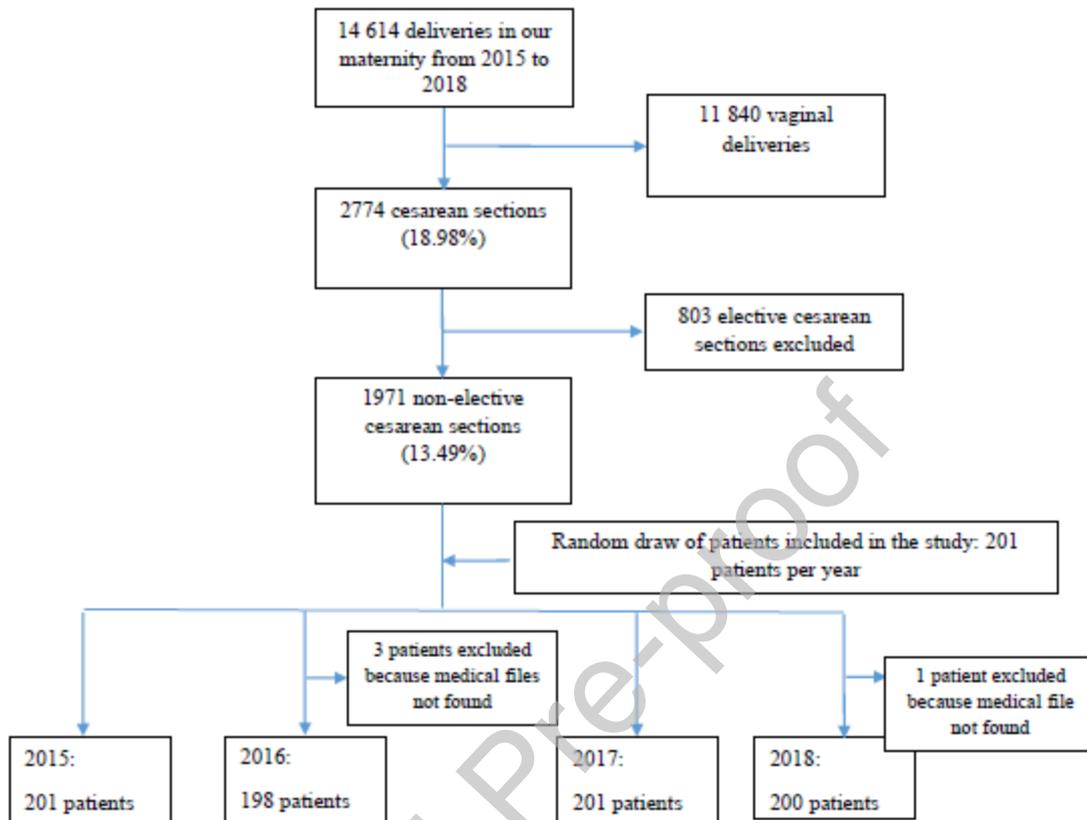
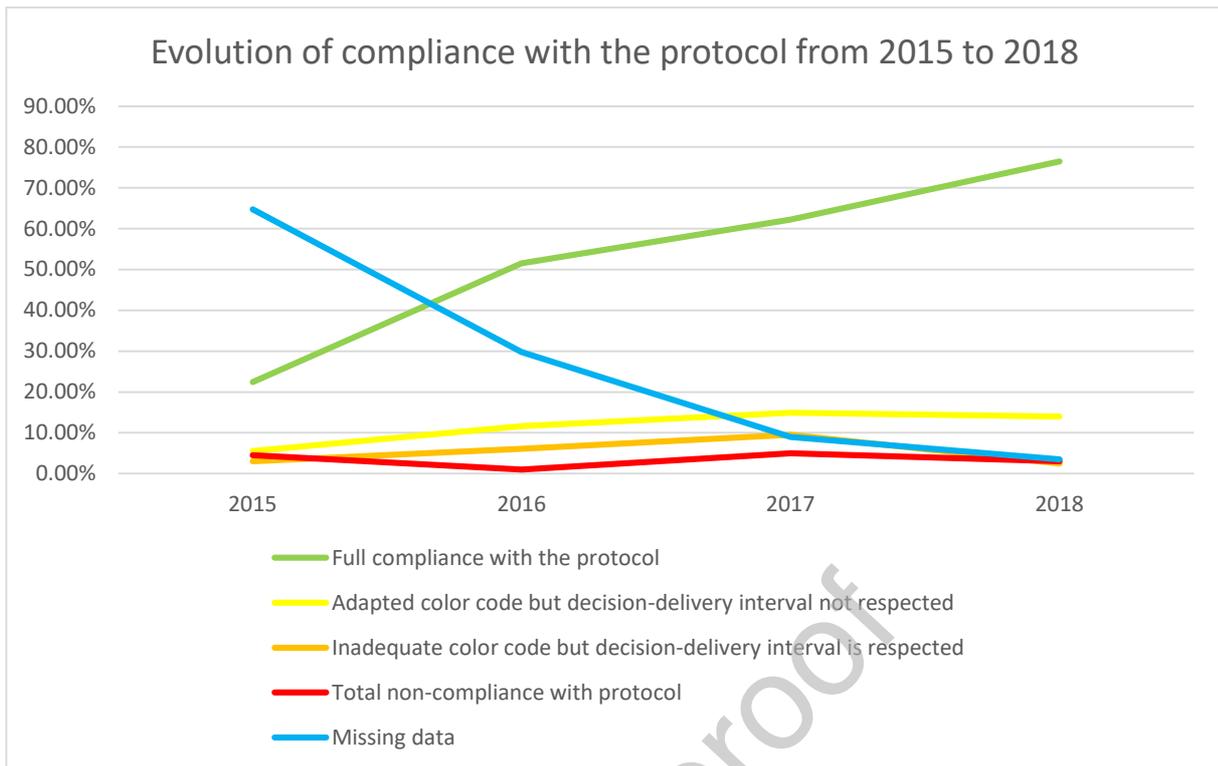


Figure 2. Change in the compliance with the protocol from 2015 to 2018.



- Tables

Table 1. Characteristics of the general population per year.

Table 2. Mean decision-delivery interval per year and color code.

Table 3. Outcomes for red code cesarean sections.

Table 4. Maternal and neonatal outcomes.

Table 1. Characteristics of the general population per year

	population n = 800	2015 n = 201	2016 n = 198	2017 n = 201	2018 n = 200	p
Age (years)	31.2 ± 5.9	30.8 ± 5.9	31.4 ± 5.4	30.5 ± 6.3	31.9 ± 5.7	0.07
BMI	25.5 ± 5.9	24.8 ± 5.5	25.9 ± 6.9	25.3 ± 5.4	25.8 ± 5.8	0.24
Primiparous	405 50.6 %	101 50.2%	94 47.5%	122 60.7%	88 44%	0.006
Scarred uterus	230 28.8%	55 27.4%	58 29.3%	44 21.9%	73 36.5%	0.01
Therapeutic termination of pregnancy or fetal death in utero	4 0.5%	1 0.5%	2 1%	0 0%	1 0.5%	0.43
Cesarean section during labor	658 82.3%	168 83.6%	172 86.9%	149 74.1%	169 84.5%	0.005
Induction of labor	317 36.9%	67 33.3%	87 43.9%	89 44.3%	74 37.0%	0.06
Gestational Age (WG)	38.3 ± 3.5	38.5 ± 3.6	38.6 ± 3.1	38.0 ± 3.8	38.1 ± 3.6	0.25

Green code	250	7	53	86	104	0.0001
	31.25%	3.5%	26.8%	42.8%	52.0%	
Orange code	262	40	64	86	72	0.0001
	32.75%	19.9%	32.3%	42.8%	36.0%	
Red code	86	24	24	22	16	0.51
	10.75%	11.9%	12.1%	10.9%	8.0%	
No mention of color code in the medical record	202	130	56	7	8	0.0001
	25.25%	64.7%	28.3%	3.5%	4.0%	

Legend : BMI : body mass index. Results expressed on mean \pm standard deviation and n (%), significant results in bold.

Table 2. Mean decision-delivery interval per year and color code

	Global pop- ulation n = 586	2015 n = 71	2016 n = 139	2017 n = 184	2018 n = 192	p
Green codes	n = 243	n = 7	n = 53	n = 79	n = 104	0.48
DDI (minutes)	51.1 ±35.5	38.7 ±15.8	48.8±34.6	51.5±33.3	52.9±38.6	
Respect for DDI	194	6	43	62	83	0.31
≤60 minutes	79.8%	85.7%	81.1%	78.5%	79.8%	
Orange Codes	n = 258	n = 40	n = 63	n = 83	n = 72	0.31
DDI (minutes)	26.6 ±10.5	28.6±14	25.3±7.4	28±12	25±8.2	
Respect for DDI	200	30	50	61	59	0.60
≤30 minutes	77.5%	75%	79.4%	73.5%	81.9%	
Red Codes	n = 85	n = 24	n = 23	n = 22	n = 16	0.05
DDI (minutes)	12.6±3.5	13.6 ±5	13.3±2.4	11.8±3	11±2.2	
Respect for DDI	73	15	21	21	16	0.002
≤15 minutes	85.9%	62.5%	91.3%	95.5%	100%	

Legend : DDI: decision-delivery interval (in minutes)

Results expressed by mean ± standard deviation and effectives n(%), significant results in bold.

Table 3. Issues of red code cesarean sections

	Global population n = 86	2015 n = 24	2016 n = 24	2017 n = 22	2018 n = 16	p
Justified red code indication	69 80.2%	18 75%	20 83.3%	15 68.2%	16 100%	0.06
Mean DDI (in minutes)	12.6 ±3.5	13.6 ±5	13.3 ±2.4	11.8 ±3	11 ±2.2	0.05
Respect of DDI ≤15 minutes	73 85.9%	15 62.5%	21 91.3%	21 95.5%	16 100%	0.002
Type of anesthesia:						0.72
- Epidural anesthesia	28 32.6%	10 41.7%	6 25%	8 36.4%	4 25%	
- Spinal anesthesia	1 1.2%	0 0%	1 4.1%	0 0%	0 0%	
- General anesthesia	57 66.2%	14 58.3%	17 70.9%	14 63.6%	12 75%	
Arterial pH <7	n = 77 11 14.3%	n = 18 4 22.2%	n = 22 3 13.6%	n = 22 2 9.1%	n = 15 2 12.5%	0.71
Apgar score <7 at 5 minutes	16 18.6%	4 16.7%	5 20.8%	5 22.7%	2 12.5%	0.89
Neonatal death	4 4.7%	1 4.2%	1 4.2%	2 9.1%	0 0%	0.77

Legend : DDI: decision-delivery interval. Respect of DDI for the red code cesarean is defined by a delay between decision of cesarean and birth less than 15 minutes.

Results expressed on mean - standard deviation and n (%), significant results in bold.

Table 4. Changes in maternal and neonatal issues over the years

	Global population n = 800	2015 n = 201	2016 n =198	2017 n = 201	2018 n =200	p
Fetal outcomes						
Mean birth weight (grams)	3028±880	3076±878	3070±809	2985±916	2982±915	0.56
Prematurity (<37WG)	185 23.1%	43 21.4%	42 21.2%	53 26.4%	47 23.5%	0.51
Mean arterial pH	7,219 ± 0.120	7.202 ± 0.121	7.206 ± 0.121	7,231 ± 0.117	7,235 ± 0.120	0.01
Arterial pH <7	37 5.0%	13 7.1%	8 4.5%	8 4.1%	8 4.2%	0.48
Apgar at 5 minutes <7	63 7.9%	19 9.5%	15 7.6%	21 10.4%	8 4.0%	0.08
Hospitalization in neo-natal unit	238 29.8%	60 29.9%	58 28.4%	66 32.8%	54 28.0%	0.64
Neonatal death	11 1.4%	5 2.5%	3 1.5%	2 1.0%	1 0.5%	0.36
Maternal outcomes						
Total blood loss during cesarean section (in mL)	434.4± 322	442.5± 302	485.9± 351	430±327	379.8± 300	0.01
Surgery duration (in minutes)	41.2±14.1	42.2± 13.8	42.8±15	40.8± 14.7	38.9±1 2.8	0.02
PPH	272 34.0%	76 37.8%	70 35.4%	65 32.3%	61 30.5%	0.42
Severe PPH	72 9.0%	15 7.5%	23 11.6%	23 11.4%	11 5.5%	0.08

Transfusion	40	8	14	12	6	0.23
	5%	4%	7,1%	6%	3%	
Length of hospitalization in maternity (nights)	6.3 ± 2.7	6.3 ± 2.6	6.1 ± 2.3	6.5 ± 2.9	6.1 ± 3.1	0.48
Post-operative infection	24	8	9	3	4	0.21
	3.0%	4.0%	4.5%	1.5%	2.0%	
Surgical revision	12	3	3	4	2	0.93
	1.5%	1.5%	1.5%	2.0%	1.0%	
Venous thromboembolic complication	1	1	0	0	0	1.00
	0.13%	0.5%	0%	0%	0%	

Legend : WG: weeks of gestation, neonatal death: death of a newborn in the first 28 days of life (Source INED). mL: milliliters; PPH: postpartum hemorrhage.

Results expressed on mean - standard deviation and n (%), significant results in bold.