Resuscitation 122 (2018) 25–28

Contents lists available at ScienceDirect

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

24/7 in house attending staff coverage improves neonatal short-term outcomes: A retrospective study

Brahim Bensouda*, Jessica Boucher, Romain Mandel, Jean Lachapelle, Nabeel Ali

Maisonneuve Rosemont Hospital, University of Montreal, Quebec, Canada

ARTICLE INFO

Article history:
Received 24 May 2017
Received in revised form 25 July 2017
Accepted 15 November 2017

Keywords:
Call coverage
Resuscitation
Delivery room
In house attending staff

ABSTRACT

Objectives: to compare short-term outcomes of newborns over 36 weeks with Apgar scores ≤ 3 at 1 min, following the adoption of a 24/7 in house coverage schedule
Study design: A retrospective chart review comparing two 12-month epochs. Epoch 1: coverage provided by residents with availability on call at home of attending staff. Epoch 2: On site coverage by attending staff.
Results: 71 and 60 charts were reviewed from Epoch 1 and 2 respectively. The number of infants receiving chest compressions was reduced during Epoch 2 (from 19% to 1.6%, $p < 0.0001$). The proportion of infants admitted to the NICU (81% vs 61%, $p < 0.01$), and the median length of stay in hospital (61 vs 48 h, $p = 0.03$) were significantly reduced in Epoch 2.
Conclusion(s): Continuous coverage by attending staff decreased the number of admissions to intensive care as well as the duration of hospitalization stay for newborns with low Apgar scores

Introduction

Neonatologists or pediatricians are called to the delivery room when there are maternal or fetal risk factors, when delivery of a preterm infant is expected or where the newborn is depressed at birth and needs positive pressure ventilation (PPV).

Even though some centers have identified risk factors for newborns susceptible to need PPV, 6.8% to 22% of late preterm and term babies who required PPV did not have any identifiable risk factors before delivery [1–3]. An audit of Canadian institutions by Mitchell et al. found that the need for neonatal resuscitation was not anticipated in 76% of cases [4].

Improved outcomes, as well as decreased complication rates and lengths of stay have been reported with 24/7 in-house specialist coverage systems, when compared with on-demand coverage systems in the ICU literature [5].

Data does not yet exist in the neonatal literature to directly address the benefits of 24/7 in-house presence of an attending staff physician (pediatrician or neonatologist) with on-site availability in the delivery room on short term neonatal outcomes in a tertiary hospital. In particular, the outcomes of term infants with unanticipated resuscitation needs is not known. The objective of this study was to compare the short-term outcomes of infants born at ≥ 36 weeks with a low Apgar score (≤ 3 at 1 min) after switching to a 24/7 in-house attending staff coverage schedule. Our primary goal was to compare the number of admissions to NICU (neonatal intensive care unit) and duration of newborn hospitalization.

Design and methods

This was a retrospective chart study performed at Maisonneuve Rosemont Hospital, a level III urban perinatal center located in Montreal with over 2800 annual deliveries, and a 20 bed NICU. Data was obtained by review of individual patient records. The study was approved by the Maisonneuve Rosemont Hospital institutional review and ethics board. We included twelve months of consecutive live births of infants ≥ 36 weeks gestational before (Epoch 1: 1st of January 2013 to 31st of December 2013) and after (Epoch 2: January 2015 to December 2015) the introduction of 24/7 in-house attending coverage in September 2014.

In Epoch 1, coverage was provided by a junior resident (family medicine, anesthesia or pediatrics) supervised by an attending staff physician during the day time. At night time, the junior resident was the first line for calls to the delivery room and had to make the

Abbreviations: PPV, positive pressure ventilation; ICU, intensive care unit; NICU, neonatal intensive care unit; ETI, endotracheal intubation; NRP, neonatal resuscitation program; TTN, transitory tachypnea of the newborn; CPAP, continuous positive airway pressure; UVL, umbilical venous catheter.

* Corresponding author at: Maisonneuve Rosemont Hospital, 5415 Boulevard de l'Assomption, Montréal, QC, H1T2M4, Canada.
E-mail address: brahms70@hotmail.com (B. Bensouda).

https://doi.org/10.1016/j.resuscitation.2017.11.045
0300-9572/

decision to initiate PPV, and whether to admit the newborn after telephone discussion with the attending staff if he/she was not on site. The attending staff on call had to be present in the delivery room before births (above 36 weeks) only if there was a request from the obstetrician or anesthesiologist when a high-risk delivery was anticipated.

In Epoch 2, the pediatric attending staff was available on site 24/7 and accompanied the resident on calls. A direct call system with an emergency phone was implemented to allow immediate assistance for urgent calls to the delivery room. The implementation of the in-house system coverage in Epoch 2 was possible after the recruitment in September 2014 of 4 additional neonatologists with hospital and government support to enhance the standard of care in this tertiary level center. The attending staff group was composed of 3 pediatricians and 6 neonatologists.

All residents taking pediatrics call in our center had to be certified in NRP (neonatal resuscitation program) before starting their rotation in both epochs. Obstetricians and anesthesiologists were in house during both epochs. No neonatal-perinatal medicine trainees (fellows) or nurse practitioners were available in our center. There was no dedicated neonatal resuscitation team in either period.

Inclusion criteria

Infants born at ≥ 36 weeks gestational age with Apgar score ≤ 3 at 1 min of life and born in Maisonneuve Rosemont Hospital in Epoch 1 and Epoch 2 were included in order to identify as many infants requiring **r**esuscitation at birth as possible. Infants below 36 weeks were excluded, since it is the policy in our center to automatically admit those infants to the NICU.

Exclusion criteria

Infants with known severe congenital malformations (gastroschisis, omphalocele, anal atresia) were excluded.

Outcomes

The primary outcome was admission to the NICU. Secondary outcomes included duration of stay in the NICU (if admitted) and the total length of stay in hospital. We also recorded the number of transfers to a regional center for therapeutic hypothermia or further investigation.

We identified the time of arrival of the pediatric attending staff as reported in the chart. The following additional data were retrospectively collected: Apgar score at 1, 5 and 10 min, gender, type of delivery (vaginal delivery vs caesarean section), term at birth, birth weight and time of delivery (daytime or night time). The daytime shift was defined as the period between 8am and 5pm and the night time shift was defined as the period between 5pm and 8am. We reported the resuscitative measures taken in the delivery room whether performed by the attending, the resident or other health care provider: (no intervention, PPV, endotracheal intubation (ETI), intra venous or endotracheal epinephrine, chest compressions). Axillary temperature at admission was recorded for infants admitted to the NICU.

Table 2
Pediatric attending staff arrival time.

	Proportion of staff arrived by time, percentage (n)	
Arrival time	Epoch 1 (at home call)	Epoch 2 (in-house call)
Before birth	26.8% (19)	33.3% (20)
< 5 minutes after birth	36.6% (26)	65.0% (39)
< 10 minutes after birth	53.5% (38)	91.7% (55)
< 15 minutes after birth	59.2% (42)	98.3% (59)
< 30 minutes after birth	64.8% (46)	98.3% (59)
≥ 30 minutes after birth	100.0% (71)	100.0% (60)

Percentages and numbers shown are cumulative, calculated from the time of delivery.

Statistical analysis

Continuous data were summarized using medians, and interquartile ranges. Primary and secondary outcomes were compared between both epochs using the Mann-Whitney test. Categorical variables were compared using the chi-squared test.

Results

There were 71 and 60 newborns identified with an Apgar score ≤ 3 at 1 min during Epoch 1 and 2 respectively. Gestational age, birth weight, sex, Apgar score at 1, 5 and 10 min, and time of birth were similar across time periods (Table 1).

Table 2 compares the time of arrival after birth for the pediatric attendings on call. Displayed percentages are cumulative from the time of birth. The proportion of deliveries where staff was present before birth was 26.8% and 33.3% in epoch 1 and 2 respectively. All infants who were admitted to the NICU, in both periods, were admitted before 30 min of life.

The proportion of infants admitted to the NICU and the median length of stay in hospital were significantly reduced in Epoch 2 (Table 3). We noted a significant reduction in the number of infants receiving chest compressions during Epoch 2, while the use of CPAP was significantly higher (Table 3). 3 infants received endotracheal epinephrine in Epoch 1 and none in Epoch 2. No IV epinephrine was administered in either period. Other resuscitative measures were unchanged. There were 6 transfers to a referral center for possible therapeutic hypothermia (4 cases in Epoch 1 vs 2 cases in Epoch 2). 2 infants were transferred in Epoch 1 for suspected congenital heart diseases. No infants died in either period.

Table 1
Neonatal demographic characteristics.

	Epoch 1 (At home call)	Epoch 2(In-house call)	*p value*
n	71	60	
Gestational age (weeks), median (IQR)	40 (39–41)	40 (39–40.5)	*0.91*[1]
Birthweight (g), median (IQR)	3470 (3080–3985)	3380 (3115–3795)	*0.47*[1]
Number female, (%)	39 (55)	25 (42)	*0.13*[2]
Number born by C-section, (%)	38 (54)	22 (37)	*0.0537*[2]
Apgar score 1 min, median (IQR)	2 (1–3)	2 (1–3)	*0.63*[1]
Apgar score 5 min, median (IQR)	6 (5–8)	6 (6–8)	*0.49*[1]
Apgar score 10 min, median (IQR)	9 (7–9)	9 (8–10)	*0.11*[1]
Night time birth	54 (76%)	38 (63%)	*0.11*[2]

IQR: inter-quartile range.
[1] Mann-Whitney test.
[2] chi-squared test.