

Authors: Dr Emily Williams, Dr Eleanor Walder, Dr Salma Elhag and Dr Katharine McDevitt

Peterborough City Hospital, North West Anglia NHSFT

Background:

Endotracheal intubation is a commonly performed procedure within neonatal medicine; aiming to provide a secure airway, allow mechanical ventilation and administration of surfactant.

The intubation procedure is invasive and can cause pain and physiological disturbance such as bradycardia, hypoxia, and hypertension which can precipitate an intraventricular haemorrhage in premature neonates. Pre-medications have been shown to reduce this disturbance and make the procedure easier and faster¹.

The neonatal team at Peterborough City Hospital (PCH), a level 2 NICU, anecdotally noted that there were significant delays in the intubation process where pre-medication was required.

Objectives

A service evaluation was carried out to examine the following:

1. What is the time interval between decision to intubate and completion of intubation?
2. What are the causes of time delays during intubation?
3. Does documentation meet the standard set by the East of England (EoE) Neonatal Network?

Methods:

Using BadgerNet filters, all babies admitted to the local neonatal unit (LNU) from 1st January 2021 to 31st August 2022 who had been intubated were identified. Babies who had been intubated in a different hospital prior to transfer to PCH were excluded.

A retrospective review of the notes of these 40 babies was conducted to examine the following criteria, which were based on the East of England Neonatal Network guidelines on Endotracheal Intubation²:

1. Reason for intubation
2. Date and time of decision to intubate
3. Time drugs prescribed and administered
4. Time intubated
5. Number of intubation attempts
6. Size of endotracheal tube (ETT) and length at lips
7. Post-intubation chest X-Ray (CXR) and changes made

References:

- 1: EoE Neonatal Network Pre-medication for endotracheal intubation guideline (2020)
2: EoE Neonatal Network Endotracheal intubation guideline (2022)

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Results:

In this time period, **18 babies were intubated electively** using premedication, and **22 were intubated as an emergency** without pre-medications; 19 in the delivery room and 3 on NICU for blocked ETTs.

The median time to electively intubate a baby was 51 minutes (Figure 1). This was composed of **20 minutes** between decision to intubate and prescription, **25 minutes** from prescription to administration of medications, and **6 minutes** to complete the intubation once medications were given. In comparison, it took 7 minutes to complete an emergency intubation.

Finally, **the documentation of neonatal intubation was not compliant with EoE standards;** particularly time and date of decision to intubate, confirmation of ETT position on CXR, and changes made after CXR **(Figure 2).**

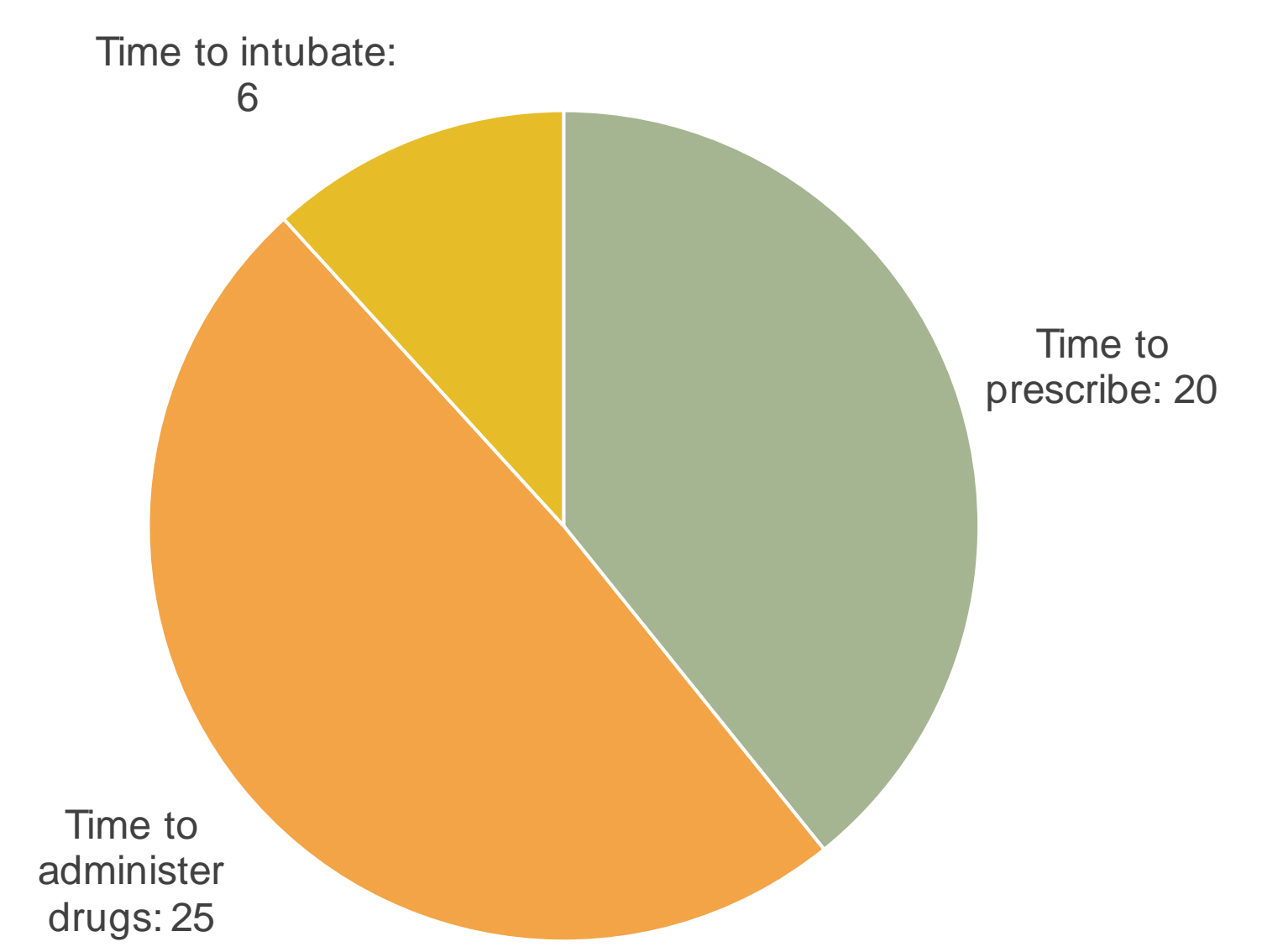


Figure 1: Breakdown of the average (median) intubation process in minutes

Standard Documented	Emergency Intubation (%)	Elective Intubation (%)
Date and time of decision to intubate	55.6	50
Date and time of successful intubation	77.8	81.8
Size of ETT	100	100
Length of ETT	91	94
Number of attempts	91	100
Confirmation of ETT on CXR	68.2	94.4
Changes made to ETT after CXR	63.6	61.1

Figure 2: Percentage of cases where the specified criterion was documented

Conclusions:

1. The time interval from decision to intubate to completion of intubation is on average 51 minutes.
2. Causes of delayed intubation include delay to prescription and time to prepare medications.
3. Our documentation does not currently meet the standard recommended by the EoE guideline, particularly with regards to timings of the intubation procedure and changes made after CXR.

Interventions:

With the support of a multidisciplinary team including medical, nursing and pharmacy colleagues, we have created several ways to improve upon this process.

1. A prescription sticker has been created to pre-prescribe medications for intubation on admission to the unit, for intensive care or high dependency babies (Figure 3).

DATE	DRUG	DOSE	ROUTE	SIGNATURE	DATE & TIME GIVEN	GIVEN BY	WITNESS	PHARMACY
	FENTANYL (2 microgram/kg)		IV					
	SUXAMETHONIUM (2mg/kg)		IV					
	ATROPINE (20 microgram/kg)		IV					

Figure 3: Prescription sticker

2. A weight banded chart for pre-intubation medications has been created to aid faster prescription, preparation, and administration of these medications.
3. A documentation sticker has been created for the medical notes to meet the East of England neonatal network guidelines (Figure 4).
4. Complete the audit cycle.
5. These changes will be summarised in the form of a Local Safety Standard for an Invasive Procedure (LOCSSIP).

ENDOTRACHEAL INTUBATION

Baby: _____

DIS/NHS number: _____

Reason for intubation:

Mechanical ventilation ☐ Surfactant administration ☐

Other (please specify): _____

Decision to intubate (time and date): ____ : ____

Time of successful intubation: ____ : ____

____ / ____ / ____

Intubated by (print): _____

Role/Grade: _____

Number of attempts in total: _____

ETT size: _____

ETT length at lips (cm): _____

Colour change on CO2 detector? ☐

Pre-intubation drugs required? ☐

Surfactant required? ☐

CXR requested: ☐

Changes made: _____

Final ETT position: _____

THINK: If procedure not well tolerated, do you need to document further in notes?

Figure 4: Documentation sticker