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This article has been accepted for publication in *Archives of Disease in Childhood Fetal and Neonatal Edition*, 2024 following peer review, and the Version of Record can be accessed online at <https://doi.org/10.1136/fetalneonatal-2024-327458>

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Letter to the Editor:

Sedation and analgesia practices for less-invasive surfactant administration, elective endotracheal intubation, and mechanical ventilation: a national UK survey

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Preferences for pre-procedural premedication and provision of routine analgesia and sedation for ventilated babies may vary. We aimed to survey current practices in UK tertiary-level neonatal intensive care units (NICUs).

In February-April 2024, we conducted a telephone questionnaire survey of tertiary-level UK NICUs using a bespoke proforma. (Supplementary File 1) We asked practitioners about their unit's practice for surfactant administration, pre-procedural medication use before less-invasive surfactant administration (LISA) and before elective endotracheal intubation, and whether they routinely used analgesia/sedation for mechanically-ventilated infants.

We obtained responses from 54/54(100%) NICUs. Almost all (53/54) practised LISA for surfactant administration, while 1 unit practised endotracheal tube administration only. In 40/53(75%) NICUs LISA was the preferred mode of surfactant administration; in 13/53(25%) LISA was occasional but not routine because primary mode was endotracheally via the intubate-surfactant-extubate ('INSURE') method in n=12, and surfactant administration was via laryngeal or supraglottic airways ('SALSA') in n=1.

Of LISA-practising units 30/53(57%) routinely gave premedication(s) before LISA, while 20/53(38%) practised non-pharmacological methods only, and 3/53(6%) used neither premedication nor non-pharmacological methods. (Table 1).

For elective endotracheal intubation, all 54(100%) NICUs routinely administered premedication(s). Table 2 shows drugs and dosage regimes being used.

For sedation and pain relief in intubated babies undergoing mechanical ventilation, 29/54(54%) NICUs routinely used analgesics and/or sedatives: 29/29(100%) routinely used morphine and 3/29(10%) routinely used midazolam. In 25/54(46%) NICUs drugs were not routinely given unless

obvious pain/agitation; 3/54(6%) NICUs reported never using analgesic/sedative medications for ventilated infants.(Table 3: Supplementary File 2).

Our survey shows that LISA is well-established in UK tertiary-level NICUs, with 98% now practising. This is a positive finding in the wake of the 2019 National Institute for Health and Care Excellence (NICE) guideline recommendation to use a minimally-invasive technique for administering surfactant to preterm babies not needing invasive ventilation,[1] because only 34% NICUs practised LISA in 2018.[2] However, the 57% proportion of NICUs currently giving premedications before LISA appears only marginally increased from the overall rate of 51% in 2018.[2] Use or non-use of premedication remains an important clinical issue because it may directly influence a baby's comfort and chances of procedural success.

We found 100% of NICUs now give premedications routinely for elective intubations. While this compares favourably with the 37% rate in 1998,[3] and 90% in 2007.[4], that multiple different regimens are still being used indicates that there has been no narrowing of practice among NICUs with time.

We also found wide variations in practice regarding use of routine analgesia/sedation for mechanically ventilated neonates. Current evidence is limited and insufficient to support standardisation of practices.[5] But it is notable that 5 years on from the NICE guideline recommendation "Do not routinely use morphine for preterm babies on respiratory support",[1] still more than half of all NICUs routinely give morphine.

Our survey highlights significant variations remain in current premedication practices for LISA, for elective intubations, and in analgesia/sedation of ventilated infants. We reiterate the call for more clinical trials to compare regimens and to assess clinical outcomes with and without pre-procedural medications, and with/without routine sedative/analgesic use in ventilated babies.

Acknowledgments: We sincerely thank all senior nurses, doctors, and advanced neonatal nurse practitioners who kindly contributed their time and unit's data for our survey. We thank Dr Vennila Ponnusamy for reviewing the survey proforma.

Competing Interests/Conflict of interest statement: There are no competing interests and no conflict of interests to declare in relation to this work.

Funding: No funding was needed for this work.

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Author contributions: PC conceived the idea for this survey; LW and PC designed the survey proforma; LW, DS, RD, JM, SK, LJ, SC, AH, JJ, AP, FA, TT, ZW, and PC contributed to the data collection; LW analysed the data and wrote the first manuscript draft; all authors participated in its review and drafting. PC and LW wrote the final draft which was approved by all authors. PC is guarantor.

Ethics approval: Not required.

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Table 1: Premedication drugs and non-pharmacological methods used for less-invasive surfactant administration in 53 UK tertiary centres.

Regimen used	Number (%) of NICUs
Premedication drugs (dosages and range)	
Fentanyl (0.7-1.0 µg/kg)	10 (19%)
Fentanyl & atropine (0.5-2.0 µg/kg \ 8-20 µg/kg)	13 (24%)
Fentanyl & propofol (1.5 µg/kg \ 0.5 µg/kg)	1 (2%)
Fentanyl & suxamethonium (0.7 µg/kg \ 2 mg/kg)	1 (2%)
Morphine (25-50 µg/kg)	2 (4%)
Morphine & atropine (50 µg/kg \ 10 µg/kg)	1 (2%)
Midazolam (50-100 µg/kg)	1 (2%)
Atropine (15 µg/kg)	1 (2%)
Non-pharmacological methods	
Swaddling alone	6 (11%)
Swaddling & sucrose	12 (22%)
Swaddling & expressed breast milk	1 (2%)
Swaddling, sucrose, & expressed breast milk	1 (2%)
Neither drug nor non-pharmacological methods used	3 (6%)

Table 2: Premedication drugs given for elective endotracheal intubation in 54 UK tertiary centres

Drugs (dosage and range)	Number (%) of NICUs
Morphine & suxamethonium (100 µg/kg \ 2 mg/kg)	6 (11%)
Morphine, suxamethonium & atropine (100-300 µg/kg \ 2 mg/kg \ 10-20 µg/kg)	8 (15%)
Morphine, suxamethonium & fentanyl (100 µg/kg \ 2 mg/kg \ 1 µg/kg)	1 (2%)
Morphine, fentanyl, atropine & atracurium (100 µg/kg \ 3 µg/kg \ 10 µg/kg \ 500 µg/kg)	1 (2%)
Fentanyl (3 µg/kg)	1 (2%)
Fentanyl & suxamethonium (2-3 µg/kg \ 2 mg/kg)	6 (11%)
Fentanyl & atracurium (3 µg/kg \ 500 µg/kg)	2 (4%)
Fentanyl & rocuronium (2 µg/kg \ 60 µg/kg)	2 (4%)
Fentanyl, Suxamethonium & Atropine (1-6 µg/kg \ 2 mg/kg \ 10-20 mg/kg)	23 (42%)
Fentanyl, Morphine, Atropine, Ketamine & Rocuronium (1 µg/kg \ 100 µg/kg \ 20 mg/kg \ 1 mg/kg \ 60 µg/kg)	1 (2%)
Propofol (2 mg/kg)	2 (4%)
Propofol & Atropine (2 mg/kg \ 20 µg/kg)	1 (2%)

Supplementary_File_S1: (SURVEY PROFORMA)

UK Survey of Less Invasive Surfactant Administration Survey, Sedation for ET intubation, and sedation for ventilated preterm babies

Please document here which hospital you are contacting -

Introduction

Hi, my name is (INSERT) and I'm calling from the Norfolk and Norwich Neonatal Intensive Care Unit. Who am I speaking to (INSERT)

We're performing a UK survey of all Neonatal Intensive Care Units regarding their practice for Less Invasive Surfactant Administration (LISA), elective intubations and ventilation, in particular the use of analgesia and sedation.

Do you have 5 minutes to answer a few questions now?

(If not, please ask for a convenient time for them for us to call back)

Can I just ask your role on your neonatal unit; Consultant, Trainee Doctor, Clinical Fellow, ANNP, Trainee ANNP, Matron, Senior Sister/Charge Nurse, Deputy Sister/Charge Nurse Neonatal Intensive Care Nurse (Please circle).

A] Less Invasive Surfactant Administration

1) Does your Neonatal Unit use Less Invasive Surfactant Administration (LISA)/Minimally invasive surfactant administration (MIST) for the treatment of respiratory distress syndrome?

- Yes - Routinely/first line mode of administration
- Yes - Occasionally, not necessarily first choice
- No - Never (or virtually never)

2a) If NO, how is surfactant usually given in your NICU (Please circle/mark)

- via Endotracheal Tube (ETT)
- via Intubate, surfactant, extubate (INSURE)
- Laryngeal Mask Airway (LMA) or SALSA (Surfactant Administration via Laryngeal Mask or Supraglottic Airway)

2b) IF YES, do you **ROUTINELY use premedication drug for LISA/MIST?**

- Yes – routinely

- No – drugs not used routinely

i) If YES, routine premedication is used for LISA, which premedication/s do you use and at what dose?

Drug	Y/N/Optional	Dose (or range if applicable)
• Fentanyl	
• Propofol
• Midazolam
• Morphine
• Ketamine
• Atropine		
• OTHER (State).....	

(Add any relevant notes) Dependent on how well the patient is tolerating the procedure

.....

ii) If you **DO NOT** routinely use premedication drugs for LISA, what (if any) nonpharmacological methods do you use to keep a baby settled for the procedure:

- Swaddling
- Oral sucrose
- Other? (state).....

B] DRUGS FOR ENDOTRACHEAL INTUBATION IN THE NICU

1. Does your NICU use premedication drugs for elective endotracheal intubation performed in the NICU:

- Yes – routinely
- No – never
- Sometimes – please explain.....

a) If Yes, which drug(s) or combination does your NICU use routinely for premedication before intubation within the NICU?

Drug	Y/N/Optional	Dose
• Morphine
• Midazolam
• Suxamethonium	
• Fentanyl	
• Propofol
• Ketamine

- Atropine
- OTHER (State).....

C] SEDATION FOR mechanically ventilated (endotracheal ventilated) babies

1. Does your NICU routinely use drugs for analgesia and/or sedation for preterm and term babies on the ventilator.

- Yes – routinely
- No – never
- Sometimes – please explore reasons

If Yes or sometimes which drug(s) does your NICU use for sedation/analgesia for ventilated babies?

Drug	Y/N/Optional	Usual Dose/dose range)
• Morphine	
• Midazolam
• Fentanyl
• Propofol
• Ketamine
• OTHER (State).....	

Thank you for your time and participating in our survey. If you or any of your colleagues have any questions regarding the survey, please contact ANNP Liam Willgress at liam.willgress@nnuh.nhs.uk

Supplementary File S2

Table 3: Medications for analgesia and/or sedation for preterm and term babies receiving mechanical ventilation in 54 tertiary centres.

Regimen (dosage and range)	Number (%) of NICUs
Routine analgesia and/or sedation drugs used	
Morphine (10-40 µg/kg/hour)	22 (40%)
Morphine & midazolam (5-40 µg/kg/hour \ 5-120 µg/kg/hour)	2 (4%)
Morphine & fentanyl (5-30 µg/kg/hour \ 1-3 µg/kg/hour)	1 (2%)
Morphine, midazolam, & fentanyl (10-20 µg/kg/hour \ 60-120 µg/kg/hour \ 1-2 µg/kg/hour)	1 (2%)
Morphine & choral hydrate (10-30 µg/kg/hour \ 30-50 mg/kg 6 hourly)	1 (2%)
Morphine, fentanyl & clonidine (5-30 µg/kg/hour \ 1-2 µg/kg/hour \ 1-2 µg/kg/hour)	
Analgesia and/or sedation use based on assessment of pain or agitation	
Morphine (5-20 µg/kg/hour)	13 (24%)
Morphine & midazolam (5-20 µg/kg/hour \ 60-100 µg/kg/hour)	5 (9%)
Morphine & rocuronium (1-40 µg/kg/hour \ 300-600 µg/kg/hour)	1 (2%)
Morphine & atracurium (10-40 µg/kg/hour \ 300 µg/kg/hour)	2 (4%)
Morphine, fentanyl & clonidine (10-30 µg/kg/hour \ 1-3 µg/kg/hour \ 1-2 µg/kg/hour)	1 (2%)
No medication used	3 (5%)