Survey of neonatal resuscitation equipment in emergency departments in the UK

Karen A Manias, Ffion C Davies, Christiane Vorwerk, Gurnak S Dasanjh, Andreas Photiou, Paul Hydes

ABSTRACT

Objective All emergency departments (EDs) should be adequately equipped and prepared to deal with unexpected neonatal deliveries and resuscitation. A study was undertaken to determine what neonatal resuscitation equipment is available in EDs in the UK and to formulate recommendations for improvement.

Methods A prospective telephone survey of all UK EDs was conducted between November 2008 and February 2009 to determine the type of neonatal resuscitation equipment available as recommended in the fourth edition of the APLS guidelines.

Results 169 EDs were identified, 137 (81%) of which successfully completed the survey. The majority of EDs followed APLS recommendations for provision of neonatal resuscitation equipment. There was a particularly good availability of basic airway equipment (99%), but 11% did not have a source of warmth, 5% lacked advanced airway equipment and 31% had no equipment for obtaining umbilical access. A Resuscitaire was present in 47% of EDs surveyed.

Conclusion There is a good level of provision of neonatal resuscitation equipment in UK EDs, although certain areas need to be addressed. There is a particular need for improving the provision of warming and advanced airway equipment. The authors consider that it is not necessary to have a neonatal Resuscitaire in the ED provided other equipment is readily available. The findings of this survey prompt the recommendation that all EDs should review their neonatal resuscitation equipment in accordance with APLS guidance, and ensure that staff have immediate access to this equipment and are comfortable with its use.

INTRODUCTION

All emergency departments (EDs) should be adequately equipped and prepared to deal with unexpected neonatal deliveries and resuscitation. Maternity Clinical Management Standards issued by the Clinical Negligence Scheme for Trusts (CNST) state that it is essential that neonatal resuscitation equipment is available and ready for use at all times in all care settings where deliveries may occur. This must include the emergency department where there is one.2

Whether or not the ED normally receives children, a newborn baby can need treatment under several circumstances such as:

- Mother with concealed or denied pregnancy delivers in ED.
- Emergency caesarean section for trauma/mother in cardiac arrest or periarrest for any other reason.
- Baby ‘left at doorstep’ shortly after birth.

- Parents unable to get to maternity unit owing to precipitate delivery or are unfamiliar with local geography and services so arrive at ED if birth imminent or just happened.

According to Advanced Paediatric Life Support (APLS) guidelines, a flat surface, warmth, knowledge and a way to deliver air or oxygen at a controlled pressure is sufficient for the resuscitation of newborn babies.3 Most neonates respond to drying, warming, suctioning and tactile stimulation rather than requiring overzealous resuscitation.4 Equipment recommended in APLS guidelines includes:

- Source of warmth.
- Dry towels.
- Basic airway equipment (eg, source of air/oxygen, face masks, bag-valve mask with pressure-limited device, oropharyngeal airway, a suction system with catheters at least 12F).
- Advanced airway equipment (eg, laryngoscopes with straight, 0 and 1 blades, endotracheal tubes size 2.5–4.0 mm, endotracheal styler).
- Umbilical cannulae.

Specifically, a Resuscitaire is not listed. These portable devices are custom-made for neonatal delivery and enable many of the features above for a small team setting. A radiant warmer may limit heat loss during interventions because of easy access and rapid radiant warmer responsiveness.4 Other heating devices exist (such as the Transwarmer), and EDs should have a supply of warmed blankets.

As the need for delivery resuscitation of the newborn in an ED setting cannot be predicted in most cases, it is judicious to train ED staff on standard national guidelines (eg, the Advanced Paediatric Life Support course)3 so that they can manage the first few minutes without expert help. The ED should ensure that suitably trained medical and nursing staff are available at all times.6

Most available guidelines refer to a controlled delivery situation rather than prehospital deliveries where the baby may have already cooled. Prevention of heat loss (normal delivery) should be distinguished from active rewarming which is less evidence-based and may require different measures. Similarly, in the maternal periarrest situation, the baby may be hypoxic and/or shocked. In these situations, expert paediatric help is needed (urgently by telephone if not present on site). Warming equipment for neonates is particularly important as hypothermia can easily occur and is a significant cause of morbidity and mortality.

This survey was undertaken to determine what neonatal resuscitation equipment is available in...
EDs in the UK and to formulate recommendations for improvement in the provision of this equipment.

**METHODS**

**Study design and population**

A prospective telephone survey (appendix) of all UK EDs listed in the BAEM directory of 2003 was conducted. Adult-only and children-only departments and those with combined adult and children’s services were included. Minor injury units were excluded. The survey was conducted between November 2008 and February 2009. Non-responders were contacted up to three times.

**Survey design**

The survey consisted of a series of questions to determine the type of neonatal resuscitation equipment available and ready for use in the ED as recommended in the APLS guidelines (4th edition). Questions specifically included the presence and use of a neonatal Resuscitaire in the ED. The questionnaires were completed by the most senior nurse/charge nurse on duty, ideally with responsibility for ED paediatric services.

**Data analysis**

Descriptive data analysis was performed using SPSS Version 14.0 (IBM).

**RESULTS**

A total of 169 ED were identified, 137 (81%) of which successfully completed the survey. Four types of EDs were identified, the majority of which were providing joint care for adults and children (table 1).

We found that there was a good provision of basic airway equipment and dry towels, but that the availability of warming devices, advanced airway equipment and umbilical access devices could be improved (table 2). Different types of ED varied in their provision of neonatal resuscitation equipment (table 5).

**Types of warmth source**

The sources of warmth in EDs consisted of Resuscitaires (47%), Bair Huggers (25%), overhead heaters (21%), warming blankets (20%), warming pads (8%), Transwarmer (8%), warmed fluids (5%), Babytherm (1.5%) and Cosicott, blood warmer and thermal mattress (1%). The majority of EDs had more than one available type of warmth source.

A Resuscitaire was present in 47% of the EDs surveyed. It was noted that although staff commented that it was rarely needed.

**DISCUSSION**

This is the first study to assess the availability of neonatal resuscitation equipment in EDs in the UK. There was a high response rate, with 81% of all EDs completing the questionnaire. The study showed that the majority of EDs follow APLS recommendations, possessing most of the neonatal resuscitation equipment listed in the 4th edition of the APLS guidelines. There was particularly good availability of basic airway equipment (99%) and dry towels (95%). The findings of our survey did, however, highlight a number of areas for improvement in the provision of equipment for effective neonatal resuscitation in the ED.

Of the EDs surveyed, 11% were not equipped with a source of warmth and there was a difference in the priority placed on neonatal warming in different types of ED. Warming is of vital importance as neonates have a low percentage of body fat and are at high risk of hypothermia. All EDs should possess a warming device as hypothermia incurred during postnatal resuscitation is associated with significant morbidity and mortality. The availability was particularly limited in EDs catering for adults only: only 57% of adult-only EDs had a source of warmth compared with 100% of children-only EDs. Having an effective source of warmth in the ED is paramount for effective neonatal resuscitation, so the lack of warming equipment in the ED must be addressed.

Although a high proportion of EDs possessed advanced airway equipment (95%), this is vital for neonatal resuscitation and should be present in all EDs. Similarly, basic airway equipment for neonates (which we found to be available in 99% of departments surveyed) should be present in every ED. The availability of umbilical access kits was low in all types of ED, being present in only two-thirds of departments surveyed. This may be because umbilical access devices are rarely used outside neonatal units, and ED staff are unfamiliar with the technique of umbilical cannulation. As it is important to use familiar equipment in an emergency setting, it may be more appropriate for ED staff to obtain intravenous or intraoral access rather than attempt rarely-used techniques. Paediatric staff will, however, be able to obtain umbilical access, and the necessary equipment should be readily available for their use in the ED. It should be noted that fine-bore nasogastric tubes may be used for emergency umbilical access if other equipment is unavailable.

Less than half of all EDs surveyed possessed a Resuscitaire. The Resuscitaire is a convenient piece of equipment for neonatal resuscitation which contains oxygen and ventilation facilities, suction, overhead heaters, all the required instruments, and trays, shelves and IV poles. A Resuscitaire is, however, designed for use by a two-person team, which is not common in the ED. It is a large bulky piece of equipment which could pose difficulties for storage and is expensive, costing around £9240 per unit. It could be argued that it is not necessary to have a Resuscitaire in the ED, provided the equipment recommended for neonatal resuscitation in APLS guidance is readily available. This is the view of the authors and is supported by the fact that 53% of EDs surveyed (including the ED of one children’s hospital) did not possess a Resuscitaire.

The main limitation of this study was the difficulty in ascertaining the accuracy of the responses to our survey.
We attempted to address this by speaking to the most senior nurse on duty, preferably one with responsibility for the paediatric department who should have been familiar with the equipment present in the ED. It was, however, difficult to validate that all responses given were correct.

CONCLUSION
We found that there is a good level of provision of neonatal resuscitation equipment in UK EDs, although certain areas need to be addressed. Our survey highlights the need for improving the provision of warming equipment in all EDs, particularly those not accustomed to dealing with paediatric patients. The availability of advanced airway equipment should also be improved. We would argue that it is not necessary to have a specific neonatal Resuscitaire in the ED, providing all equipment recommended by APLS for neonatal resuscitation is readily available for use.

The findings of this survey prompt the recommendation that all EDs should review their neonatal resuscitation equipment according to APLS guidance and ensure that staff have immediate access to this equipment and are comfortable with its use.

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Competing interests None.

Contributors KM: study design, literature review, data collection, data analysis, writing and editing article; acts as guarantor for article. FD: data analysis, writing and editing article. CV: study design, checking data analysis, writing and editing article. GSD: study design, data collection, editing article. AP: data collection, editing article. PH: data collection, editing article.

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REFERENCES

APPENDIX
Structure of questionnaire
Introduction
Ask to speak to senior nurse/charge nurse (or for Paediatrics if a separate children's ED)

“Good morning, my name is … and I am calling from the emergency department in Leicester Royal Infirmary. We are conducting a survey of all emergency departments in the UK to find out what neonatal resuscitation equipment is available in different regions. We are doing this because there are no clear guidelines about what equipment is required.

We are including all types of emergency department as a baby can be born anywhere. The results will be anonymous.

Could you spare a couple of minutes to answer six questions?"

If inconvenient: “I could call back later if this is not a convenient time?”

Questions
Is the following equipment for neonatal resuscitation easily accessible in your emergency department?
1. Source of warmth. If so what?
2. Dry towels
3. Umbilical access kit
4. Basic airway equipment for a baby less than normal birth size (eg, face mask, bag-valve mask)
5. Advanced airway equipment for a baby less than normal birth size (eg, oropharyngeal airways, laryngoscopes, endotracheal tubes)
6. A Resuscitaire. If so, in your experience, have ED staff used it or only the neonatal/paediatric staff? Has it proved useful?

Is there anything else you would like to add?

Thank you very much for your time.

Table 3 Type of equipment in different types of emergency departments surveyed (n=137)

<table>
<thead>
<tr>
<th>Source of warmth</th>
<th>Dry towels</th>
<th>Umbilical access kit</th>
<th>Basic airway equipment</th>
<th>Advanced airway equipment</th>
<th>Resuscitaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults only</td>
<td>4 (57%)</td>
<td>7 (100%)</td>
<td>6 (88%)</td>
<td>7 (100%)</td>
<td>6 (86%)</td>
</tr>
<tr>
<td>Children only</td>
<td>4 (100%)</td>
<td>3 (75%)</td>
<td>3 (75%)</td>
<td>4 (100%)</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>Adults and children combined</td>
<td>83 (88%)</td>
<td>90 (96%)</td>
<td>54 (57%)</td>
<td>93 (99%)</td>
<td>87 (93%)</td>
</tr>
<tr>
<td>Adults and children separate</td>
<td>31 (97%)</td>
<td>30 (94%)</td>
<td>22 (69%)</td>
<td>32 (100%)</td>
<td>31 (97%)</td>
</tr>
<tr>
<td>Total</td>
<td>122 (89%)</td>
<td>130 (95%)</td>
<td>85 (62%)</td>
<td>135 (99%)</td>
<td>128 (93%)</td>
</tr>
</tbody>
</table>

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