Key words: 
Ex-utero transfer; transport service; premature infants; audit; survival rate.

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Abstract

Background. Outcome for high-risk infants transferred in-utero is reported as better than the outcome of infants transferred after birth.

Aim. The aim of this study is to present the first Macedonian neonatal emergency transport service in the frame of the neonatal intensive care unit at the Pediatric University Hospital in Skopje.

Material and methods. The first Macedonian NETS is working since 2002 in the frame of the NICU in the Pediatric Hospital in Skopje. It provides transport with Ginevri shuttle and transport vehicle for the premature and critically ill neonates in Macedonia. We audited the NETS records of all premature infants and critically ill neonates in non-tertiary centers requiring the mini-hospital transfer at NICU from January 2002 until December 2008.

Results. 430 infants were transferred during a 7 year period. The overall survival was 60%. Of the 81 babies known to have died, 10 died during the first 24h after admission to Level 3 and the rest of them either from complicated surgery or from another pathological cause. None of them died while the team was en route or during primary stabilisation.

Conclusion. The survival outcome for the premature babies and critically ill neonates requiring ex-utero transfer appears to be worse compared to those in tertiary units. But given the unique opportunity with this transfer the overall survival of those infants who would have died anyway in the past has decreased and sequentially the mortality rate in Macedonia.

Introduction

Newborn transport is used to move premature and other sick infants from hospitals to hospitals with neonatal intensive care and other specialist services. Neonatal transport services (NETS) utilise mobile intensive care incubators fitted with mechanical ventilators, infusion pumps and physiological monitors capable of being used in a mobile environment. Power and medical gas supplies are carried within the system, as well as making use of external supplies (as available). These transport systems seek to emulate the environment of a neonatal intensive care and permit uninterrupted care while transferring the neonate by road or air ambulance. Normally, regular ambulance staff and their vehicles are not equipped to transport sick newborns. Team composition varies from one
country to another, with options including two or three persons, combinations of a nurse, a doctor and a driver. The neonatal transport service is the first of that kind in the Republic of Macedonia made as a paradigm of the Australian model.

Benefits from NETS: lower perinatal morbidity and mortality; R&R ("Roll and run" procedure) is avoided; economical, although one life has no price.

How does the utility staff work after primary stabilization?

- Our model of care is one based on continuity, communication and interaction. Initially the babies and families are cared for by the nurses and doctors in intensive care. A team of nurses from the nursery now continue care in the form of the family support team. Three nurses link in with the families when they are discharged, see them at home, forming a bridge between the nursery and home and community services.
- The follow up team is also part of this extended care and especially our rehabilitator, who sees the babies in the nursery and at the follow up visits with the doctors in order to give an advice.
- Providing a service to the children and the families is our most important focus. We time the visits so that we can provide information that is useful to families and link in with any other health professionals who they might be seeing.
- Audit is also a vital function. Without knowing the long term outcome of all of the infants, there is incomplete knowledge of the success or not of intensive care. Research is necessary for all new procedures or medications.

Material and methods

The first Macedonian neonatal emergency transport service is working since 2002 in the frame of the neonatal intensive care unit at the Pediatric University Hospital in Skopje.

It provides transport with Ginevri baby shuttle and transport vehicle for the premature babies and critically ill neonates in Macedonia, Kosovo and Albania and Montenegro. Every time NETS is contacted by a clinician regarding transfer the information is entered into the NETS database. We have audited the NETS records of all premature babies (27-35 GA) and critically ill neonates in a non-tertiary centers requiring the mini-hospital transfer at the NICU from January 2002-December 2008.

Broad clinical guidelines and indications for transfer have to be made prior starting the transport. For most of the patients, retrieval could be appropriate and some could be adequately transported with an escort from the referring hospital. Thanks to the guidelines that we have received from Australia we have made our own propositions for making decisions for transfer, such as:

1. Low birth weight infants (< 2500g), especially < 1800g should be in Level 2 neonatal nurseries with facilities for oxygen therapy, intravenous access, cardio-respiratory monitoring and blood gases;
2. Very low birth weight infants (< 1500g) should (at least initially) be nursed in Level 3 neonatal nurseries with 24h medical care on site and ready access to mechanical ventilation;
3. Infants with respiratory distress of early-onset, rapid in progression or persisting beyond 5-6 hours;
4. Babies requiring more than FIO₂ 0.40, for more than 2h should be monitored trough blood gases, as well as saturation monitoring. (If this is not feasible, transfer should be considered);
5. Respiratory distress associated with aspiration of meconium follows an unpredictable course and therefore should be referred early;
6. Infants with cyanosis persisting despite oxygen therapy;
7. Infants who become unwell after initially being well in the hours following birth;
8. Infants with depression following perinatal asphyxia. Apgar score of less than 8 should be considered for transfer;

Typically, newborn transport teams spend some time stabilising the baby’s condition prior to transport. Without adequate stabilisation, a clinical deterioration en route can be expected. Wherever possible (and safe), in utero transfer is generally preferable to newborn transport. Transfer of the mother while still pregnant and with her infant unborn leads to improved survival and quality of survival for the baby (1-4). Studies have shown that mortality is lower for premature infants and critically ill neonates suffering different diseases born in tertiary centers versus non-tertiary (5-10).

The aim of this study is to present the first Macedonian neonatal emergency transport service in the frame of the neonatal intensive care unit at the Pediatric University Hospital in Skopje.
9. Unwell infants with shock, lethargy, poor feeding, weak cry, cyanosis or vomiting;
10. Infants with apnoea or seizures;
11. Infants with bleeding from any site;
12. Infants who may require exchange transfusion for jaundice;
13. The infant of a diabetic mother;
14. Infants needing surgery; e.g. bowel obstruction (including imperforate anus), myelomeningocele, choanal atresia;
15. Heart failure or arrhythmia;
16. Infants requiring special diagnostic and/or therapeutic intervention.

What should the referral physicians do while waiting for NETS?

- For babies with respiratory distress (and most importantly in diaphragmatic hernia) or bowel obstruction, place a gastric venting tube. Nurse the baby prone or decubitus (left side up) and minimise handling. Babies requiring oxygen should have it via a head-box oxygen delivery system.

- Transcutaneous oxygen monitor is preferred for smaller babies (< 1500g) who may be put at risk by hyperoxaemia. Babies outside the neonatal period may be more easily monitored using a saturation pulse oximeter.

- Keep the FIO₂ high enough to maintain a pink colour, saturation > 90% or skin oxygen above 60 mmHg at all times. Gently suction the mouth to remove major secretions (A disposable short Y-sucker is recommended).

- Maintain the baby's temperature around 36.5°C (skin). The recommended incubator temperature for normal birth weight infants is 33°C-37°C for the smallest infants (< 1000g).

- If using an open incubator or “resuscitaire” with radiant heater, do not interpose any insulation foil between the heater and baby. (Difficulty warming a baby may indicate poor perfusion and require improved tissue oxygenation.)

- Check the blood sugar using a strip. Correct hypoglycaemia with 10% glucose at 2ml/kg followed by an infusion at the maintenance fluid rate. A guide to fluid rates based on weight and by the day of age is as follows: 1 kg 4 ml/kg/hour; 2 kg 5 ml/kg/hour; and 3 kg 5 ml/kg/hour

- Place an i.v. line in a peripheral vein or umbilical vein for management of fluids, dextrose or electrolytes. (Summary: keep the baby pink, warm and sweet.)

The Macedonian Perinatal Emergency Referral Service works to facilitate perinatal emergency transfers and provide access to obstetric and neonatal resources and clinical advice about perinatal emergencies.

The outcome for high risk infants transferred in-utero is reported as better than outcome of infants transferred after birth. NETS is staffed by a dedicated team providing expert clinical advice, clinical co-ordination, stabilisation and emergency treatment and retrieval for very sick children; 24 hours a day, 7 days a week.(10-12)

Results

In a 7 year period 430 infants were transferred. The median response and retrieval times were 1h 50 min and 3h 50 min (for cardio-surgery in Bulgaria). The overall survival is 60%. Survival rate at 32-35 GA was 43%. 83 babies known to have died, 10 died during the first 24 hours after admission to Level 3 and the rest from complicated surgery or from another pathological cause. None of them died while the NETS team was en route or during primary stabilization.

Table 1: Realized transports by NETS until the end 2008.

<table>
<thead>
<tr>
<th>Year</th>
<th>Local</th>
<th>National</th>
<th>To Bulgaria</th>
<th>To Kosovo</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>11</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>2003</td>
<td>25</td>
<td>22</td>
<td>3</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>2004</td>
<td>21</td>
<td>19</td>
<td>5</td>
<td>0</td>
<td>45</td>
</tr>
<tr>
<td>2005</td>
<td>15</td>
<td>23</td>
<td>11</td>
<td>0</td>
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<tr>
<td>2006</td>
<td>35</td>
<td>22</td>
<td>33</td>
<td>0</td>
<td>90</td>
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<tr>
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<td>31</td>
<td>25</td>
<td>44</td>
<td>3</td>
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<tr>
<td>2008</td>
<td>26</td>
<td>19</td>
<td>30</td>
<td>0</td>
<td>75</td>
</tr>
<tr>
<td>Total</td>
<td>164</td>
<td>135</td>
<td>128</td>
<td>3</td>
<td>430</td>
</tr>
</tbody>
</table>

Local transports were made from CGO, SHGO-Chair, City Hospital, Kozle, to and from Department of Children's Surgery, to Institut of Rontgenology (CTM & MRI), to Clinic of Infectology and private hospitals (Remedika and M. Bogorodica) and national transports were made from Strumica, Prilep, Bitola, Kumanovo, Kichevo, Tetovo, Gostivar, Gevgelija, Kriva Palanka, Veles, Debar i Ohrid.

Transport complications from all transports done in Macedonia were cardiovascular or respiratory.

Cardiovascular complications: 41% changes in arterial tension; 20% changes in hearth activity; respi-
ratory complication: 27% obstruction of respiratory airways; and 23% hypoxemia.

Transport complication while transporting the patient: hypoventilation – acute gastric dilatation 45%; accidental decanulation 23%; variability of body temperature 14%; CNS endangerment 10%.

Discussion

The survival outcome for premature babies and critically ill neonates requiring ex-utero transfer appears to be worse compared to those in tertiary unit. The overall survival rate of those who would have died anyway in the past has increased and sequentially the mortality rate in Macedonia has decreased. The data shows that mortality rate has decreased from 13‰ to 8.9‰ with ex-utero transport as a result of the intervention of the mini hospital educative team.

References


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