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Original article

Delivery room management of ELBW infants in Italy

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Summary. In this article we evaluated the consistency of practice and the adherence to the International Guidelines in early delivery room management of ELBW infants in Italy. A polyethylene bag/wrap was used by 54 centres (55.1%). In Northern regions, one centre (2.5%) reported to use oxygen concentrations >40% to initiate positive pressure ventilation in ELBW infants. These proportions were higher in the Central (14.3%) and Southern (16.2%) areas. A T-piece device for positive pressure ventilation was widely used (77/97, 79.4%). A median of 13% (IQR: 5%–30%) of ELBW infants received chest compressions at birth in Italy. Forty-seven out of 98 (47.9%) centres declared to administer prophylactic surfactant in delivery room. Although there were geographic differences in the country, our results showed a good general adherence to the International Guidelines for Neonatal Resuscitation. (www.actabiomedica.it)

Key words: delivery room, ELBW, infants

Introduction

Approximately 5 to 10% of newborns require some assistance to begin breathing at birth. About 3% are managed with positive pressure ventilation (PPV) and <1% require extensive resuscitative measures such as intubation, chest compressions and medication. These percentages rise noticeably in preterm infants (1-3). An increasing body of evidence suggests that delivery room management of extremely low birth weight (ELBW) infants may have a direct influence on their survival and long-term morbidity (3-6). Therefore, their general outcome could be improved throughout a structured and well-coded approach starting from the first minutes of life (7-10).

In this article we evaluated the consistency of practice and the adherence to the International Guidelines for Neonatal Resuscitation in early delivery room management of ELBW infants in Italy.

Methods

The study was conducted between April and August 2012. A structured 73-item questionnaire and an accompanying introductory letter were sent by email

to the directors of the 107 Italian level III centres who provide on-site delivery, based on the Italian Society of Neonatology database. Participation was entirely voluntary.

Statistics

Categorical data are expressed as numbers and percentages, continuous data as medians and interquartile ranges (IQR). Statistical analysis was performed using R 2.12 language (R Development Core Team 2010. R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0).

Results

A total response rate of 92% (98/107) was obtained. There was a homogeneous representation of the country: North 40/43 (93.0%); Centre 21/21(100%); South 37/43 (86.0%).

Characteristics of centres

Participating centres reported an overall number of 198.322 births during 2011, and of these, 1933 were ELBW infants. Northern and Central centres had a higher median of births and of ELBW infants than Southern centres.

A provider skilled in neonatal resuscitation was present in high-risk deliveries in 46% of the centres: this rate was higher in Northern (77.5%) than in Central (33.3%) and Southern (21.6%) centres.

Temperature management

The median delivery room temperature was 24°C (IQR: 22–25). Only 18 centres (20.2%) achieved a delivery room temperature over 25°C. The use of a polyethylene bag for the management of ELBW infants at birth was reported by 54 centres (55.1%), with the highest rate in Northern ones (31/40, 77.5%). Fifty-nine centres (60.2%) used a cap to cover the head of the patients at birth.

Oxygen therapy

Only a limited number of centres (10/98, 10.2%) said they used oxygen concentrations >40% to initiate resuscitation. Of these 10 centres, five said they used a 100% oxygen concentration. Almost all of these centres belonged to the Central and Southern groups. Most centres had a pulse oxymeter (91/98, 92.9%) available in delivery room and used saturation targets (82/98, 83.7%).

Ventilatory support

Almost all centres used a facial mask as initial interface for PPV (95/98, 96.9%; the T-piece device was widely used (77/97, 79.4%). The use of positive end expiratory pressure (PEEP) during PPV was reported by 88 centres (89.8%). Continuous positive airway pressure (CPAP) was widely used to avoid intubation (85.4%). The oral route of intubation was chosen by most centres (61.2%), but there was a large difference in geographical subgroups. Northern centres preferred the nasal route (82.5%), whereas Central and Southern centres used the oral route (81.0% and 97.3%, respectively).

The percentage of ELBW infants intubated at birth had a median of 60% (IQR: 40%–80%), with the highest values in Central group (median 66%, IQR: 50%–75%). The percentage of ELBW infants receiving only nasal-CPAP at birth had a median of 22% (IQR: 10%–40%), with the highest values in Northern group (median 25%, IQR: 8%–45%). The percentage of ELBW infants managed without any respiratory support at birth had a median of 3% (IQR: 0%–10%).

Chest compressions and medications

A median of 13% (IQR: 5%–30%) of ELBW infants received chest compressions at birth, mostly in Central (median 18%) and Southern (median 22%) centres.

Medication was given at birth to 6% of ELBW infants (IQR: 0–17%).

Surfactant therapy

In 47/98 (47,9%) centres surfactant was routinely administered in DR. The percentage of ELBW infants treated with INSURE at birth was 0% (0%-80%).

Discussion

This study reflects the early delivery room management of ELBW infants in Italy. There were relevant differences among geographical areas in the approach to the care of ELBW infants at birth.

As the delivery room management of ELBW infants may have a direct influence on the immediate survival and also on long-term morbidity (3–6), the results of this study suggest that further efforts are needed to improve this area of care. Previous studies have reported important differences in mortality rates among neonatal units and geographical regions, irrespective of the infant's characteristics, suggesting variable degrees of effectiveness of medical care (11,12).

In the last version of the ILCOR Committee on Neonatal Resuscitation, the body of recommendations devoted to the management of ELBW infants has been progressively increasing (1). These include strategies to prevent thermal losses, oxygen administration and ventilation. Our data show a different adherence to the guidelines in relation to the geographical area with the highest rates in Northern regions and lowest in the Southern areas. For example, the implementation of a simple practice to prevent hypothermia such as the use of polyethylene bag/wrap was limited to 37.8% of the centres in the South, in comparison with 77.5% in the Northern regions. A very similar picture was documented for other important interventions, such as the initial fraction of oxygen.

The reasons for such discordance could be due to different organizational and educational programs among the country's regions. Although the role of continuous medical education is well-recognized, effective training programs, benchmarking and quality improvement initiatives should be further implemented and monitored. A national neonatal network including all level III Italian hospitals should be also sustained for continuous monitoring and comparison of short and long-term outcomes (13).

World Health Organization Guidelines, updated in 2003, state that environmental temperatures should be ≥25°C (14). Despite this guidance, delivery room temperatures are consistently reported to be lower than this in all healthcare settings (15,16). Also our study showed a low adherence to international guidelines that does not appear to be influenced by geographical area. The reasons that impede a widespread adoption of higher environmental temperatures remain unexplained, but perinatal teams have to consider this to be one of the greatest challenges in improving thermal care for newborn infants.

In addition, the percentages of ELBW infants who received chest compressions at birth were markedly different among the surveyed regions (median: North 5%; Centre 18%; South 22%). In the North American Vermont Oxford Network registry, which collected data on infants with birth weight of 501 to 1500 g, the proportion of those who received chest compressions was about 6% (17).

About half of the centres adopted a prophylactic strategy for surfactant administration. This approach disagree with the results of a recent meta-analysis showing a slight effect (survival without bronchopulmonary dysplasia at 36 weeks) in favor of early CPAP when compared to intubation at birth (18). However we don't know if this approach has recently changed based on the results of the most recent randomized controlled trials on this subject (18).

Overall, the results of our study are very similar to those reported in a recent survey conducted in UK: the authors found many areas of good evidence-based delivery room practice, but they identified also significant variation in delivery room resuscitation practices among neonatal services (19).

There are some limitations to this study. As we only involved the directors of the participating centres, the actual practices of individual providers may not be represented. However, a consistent part of the information obtained in this survey is related to available equipment and intent to use different practices. This study involved only tertiary units, and the approach to delivery room management of ELBW infants can be different in level I and II Italian centres. However, the majority of ELBW infants in Italy were born at tertiary units. The data on ELBW infants who were resuscitated in the centres were retrospectively collected limiting the quality of this information. Unfortunately, our questionnaire did not include questions regarding the survival rates in the surveyed centres. For this reason, we could not correlate the delivery room management with neonatal mortality.

Conclusions

Our study assess the consistency of practice and the adherence to the International Guidelines in early DR management of ELBW infants in Italy. In general, the approach to the ELBW infants at birth shows a good compliance with the International Guidelines for Neonatal Resuscitation; particular attention is devoted to temperature control, use of oxygen and less-invasive respiratory support. However, there are marked geographical differences in delivery room management of ELBW infants, and some relevant interventions are not uniformly followed by the surveyed centres. Factors contributing to such discordance remain unclear and need to be investigated in future studies. In the meantime, effective educational interventions focused on the practice of neonatal resuscitation have to be supported.

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References

1. Kattwinkel J, Perlman JM, Aziz K, Colby C, Fairchild K, Gallagher J, et al. American Heart Association. Neonatal resuscitation: 2010 American Heart Association Guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Pediatrics 2010; 126: e1400-13.
2. Perlman JM, Risser R. Cardiopulmonary resuscitation in the delivery room: associated clinical events. Arch Pediatr Adolesc Med 1995; 149: 20-5.
3. Vento M, Cheung PY, Aguar M. The first golden minutes of the extremely-low-gestational-age neonate: a gentle approach. Neonatology 2009; 95: 286-98.
4. McCall EM, Alderdice F, Halliday HL, Jenkins JG, Vohra S. Interventions to prevent hypothermia at birth in preterm and/or low birthweight infants. Cochrane Database Syst Rev 2010: CD004210.
5. Gandhi B, Rich W, Finer N. Achieving targeted pulse oximetry values in preterm infants in the delivery room. J Pediatr 2013; 163: 412-5.
6. Carlo WA. Gentle ventilation: the new evidence from the SUPPORT, COIN, VON, CURPAP, Colombian Network, and Neocosur Network trials. Early Hum Dev 2012; 88(Suppl 2): S81–3.
7. Davis PG, Dawson JA. New concepts in neonatal resuscitation. Curr Opin Pediatr 2012; 24: 147-53.
8. Vento M, Saugstad OD. Resuscitation of the term and preterm infant. Semin Fetal Neonatal Med 2010; 15: 216-22.
9. Trevisanuto D, Gizzi C, Martano C, Dal Cengio V, Ciralli F, Torielli F, et al. Neonatal Resuscitation Study Group, Italian Society of Neonatology. Oxygen administration for the resuscitation of term and preterm infants. J Matern Fetal Neonatal Med 2012; 25 Suppl 3: 26-31.
10. Sweet DG, Carnielli V, Greisen G, Hallman M, Ozek E, Plavka R, et al. European consensus guidelines on the management of neonatal respiratory distress syndrome in preterm infants – 2010 Update. Neonatology 2010; 97: 402-17.
11. de Vonderweid U, Spagnolo A, Corchia C, Chiandotto V,Chiappe S, Chiappe F, et al. Italian multicentre study on very low-birth-weight babies. Neonatal mortality and two-year outcome. Acta Paediatr 1994; 83: 391-6.
12. Horbar JD, Badger GJ, Lewit EM, Rogowski J, Shiono PH. Hospital and patient characteristics associated with variation in 28-day mortality rates for very low birth weight infants. Pediatrics 1997; 99: 149-56.
13. Ronconi A, Corchia C, Bellu R, Gagliardi L, Mosca F, Zanini R et al. Esiti dei neonati di basso peso nelle Terapie Intensive Neonatali partecipanti all'Italian Neonatal Network nel 2008. Istituto Superiore di Sanità. 2011, iii, 74 p. Rapporti ISTISAN 11/44.
14. World Health Organization. Managing newborn problems: a guide for doctors, nurses and midwives. WHO Library Cataloguing-in-Publication Data; 2003: C1-9.
15. McCarthy LK, Molloy EJ, Twomey AR, Murphy JF, O'Donnell CP. A randomized trial of exothermic mattresses for preterm newborns in polyethylene bags. Pediatrics 2013; 132: e135-41.
16. Lunze K, Bloom DE, Jamison DT, Hamer DH. The global burden of neonatal hypothermia: systematic review of a major challenge for newborn survival. BMC Medicine 2013; 11: 24.
17. Soll RF, Edwards EM, Badger GJ, Kenny MJ, Morrow KA, Buzas JS, et al. Obstetric and neonatal care practices for infants 501 to 1500 g from 2000 to 2009. Pediatrics 2013; 132: 222-8.
18. Schmolzer GM, Kumar M, Pichler G, Aziz K, O'Reilly M, Cheung PJ. Non-invasive versus invasive respiratory support in preterm infants at birth: systematic review and meta-analysis. BMJ 2013; 374: f5980.
19. Mann C, Ward C, Grubb M, Hayes-Gill B, Crowe J, Marlow N, et al. Marked variation in newborn resuscitation practice: A national survey in the UK. Resuscitation 2012; 83: 607-11.

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