MEETING ABSTRACTS

XXI Congress of the Italian Society of Neonatology

Palermo, Italy, 24-26 September 2015

Published: 24 September 2015

These abstracts are available online at http://www.ijponline.net/supplements/41/S1

MEETING ABSTRACTS

A1

3D printing in neonatal care

Roberto Auñêi 1, Simonetta Piccone 1, Maurizio Gente 2, Piemichelle Paolillo 1

1 Division of Neonatology and Neonatal Intensive Care, Casilino General Hospital, Roma, Italy; 2 Department of Pediatrics and Infant Neuropsychiatry, Neonatal Emergency Transport Service, Sapienza University of Roma, Roma, Italy

E-mail: rauñei@gmail.com


In recent years additive manufacturing, or three-dimensional (3D) printing, is becoming increasingly widespread and used also in the medical and biomedical field [1].

3D printing is a technology that allows to print, in plastic or other material, solid objects of any shape from its digital model. The printing process takes place by overlapping layers of material corresponding to sections of the final product. The 3D models can be created de novo, with a 3D modeling software, or it is possible to replicate an existing object with the use of a 3D scanner. In the past years, the development of appropriate software packages allowed to generate 3D printable anatomical models from computerized tomography, magnetic resonance imaging and ultrasound scans [2,3].

Up to now there have been 3D printed objects of nearly any size (from nanostructures to buildings) and material. Plastics, metals, ceramics, graphene and even derivatives of human tissues. The so-called "bio-printers", in fact, allow to print one above the other the thin layers of cells immersed in a gelatinous matrix. Recent advances of 3D bioprinting enabled researchers to print biocompatible scaffolds and human tissues such as skin, bone, cartilage, vessels and are driving to the design and 3D printing of artificial organs like liver and kidney [4].

Dentistry, prosthetics, craniofacial reconstructive surgery, neurosurgery and orthopedic surgery are among the disciplines that have already shown versatility and possible applications of 3D printing in adults and children [2,5]. Only a few experiences have instead been reported in newborn and infants. 3D printed individualized bioresorbable airway splints have been used for the treatment of three infants with severe tracheobronchomalacia, ensuring resolution of pulmonary and extrapulmonary symptoms [6,7]. A 3D model of a complex congenital heart defect has been used for preoperative planning of intraoperative procedures, allowing surgeons to repair a complex defect in a single intervention [8].

As already shown for children with obstructive sleep apnea and craniofacial anomalies [9], personalized 3D printed masks could improve CPAP effectiveness and comfort also in term and preterm neonates. Neonatal emergency transport services and rural hospitals could also benefit from this technology, making possible to print medical devices spare parts, surgical and medical instruments wherever not readily available.

It is envisaged that 3D printing, in the next future, will give its contribution toward the individualization of neonatal care, although further multidisciplinary studies are still needed to evaluate safety, possible applications and realize its full potential.

References


A2

Hemodynamically significant ductus arteriosus: a new targeted approach

Rosa Maria Cerbo 1 , Martina Borellini 1 , Margherita Pozzi 1 , Savina Mannarino 1 , Mauro Stronati 1

1 Neonatal Intensive Care Unit, Department of Pediatrics, IRCCS Fondazione Policlinico San Matteo, Pavia, Italy


Debate on hemodynamically significant ductus arteriosus (hsDA) in premature infants remains unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved. The association between patent ductus arteriosus (PDA) and the most adverse outcomes and comorbidities in preterm infants are unresolved.
haemorrhage and mortality) has led to the integration of ductal closure into neonatal intensive care. The recent theory that describes PDA as “an innocent bystander” is supported by the lack of evidence of significant benefits on long-term outcomes with therapeutic interventions. So, the causal relationship between PDA and comorbidities is questioned. Moreover, PDA can close spontaneously in a significant proportion of preterms [1]. Both the traditional assumption that all PDA are pathological and the most recent theory in favor of a conservative attitudeare oversimplifications [2]. The current management of PDA does not take into account the wide range of effects attributable to a ductal shunt. A more logical approach should consider the ductus as a clinical continuum, from thephysiological PDA to the pathological hsDA. Placingthe patient in the spectrum of “ductal disease” seems to be possible through a continuous evaluation of the hemodynamic and clinical consequences of ductal patency [3]. The current definition of an hsDA is almost entirely based on size [4]. However, the magnitude of transdual shunt relatesto not only to the transdual diameter, but also to the pulmonary and systemic vascular resistance and to the compensatory ability of the immature myocardium [3]. New echocardiography markers have been evaluated to estimate the impact of transdual flow on both pulmonary over circulation (left atrial/aortic ratio, anterograde pulmonary artery diastolic flow) and systemic blood flow (retrograde diastolic flow in descending aorta, left ventricular output/superior vena cava flow ratio) [5]. The possibility to evaluate flows in the middle cerebral artery, renaland superior mesenteric artery with Doppler ultrasound, allows anearly and plausible detection of regional hyperperfusion due to the “ductal steal” [3]. Other technologies that enable direct measurement of tissue oxygenation, such as Near Infrared Spectroscopy (NIRS), may also be useful to unveil thehemodynamic effects of PDA [6,7]. We are becoming increasingly aware of the role of patient’s characteristics (such as genetic profile [8], BNP levels [9], antioxidant status [10]) in PDA evolution. According to the current understanding, it seems appropriate to proposeamore tailored approach to the management of PDA in preterms, based on the integration between clinical and hemodynamic status.

References
e510-e525.

A3

Feeding very low birth weight (VLBW) or very preterm infants poses a unique challenge due to the immaturity of gastrointestinal tract. Early nutrition is crucial for improving optimal growth, long-term outcome and to decrease morbidities. The goal is to achieve a growth rate similar to fetal growth in utero.

Trophic feeding (TF) of preterm infants was introduced in the late 1980s in an attempt to overcome the lack of gastrointestinal stimulation during total parenteral nutrition. Alternative names include gut priming, minimal enteral nutrition and early hypocaloric feeding. TF is defined as providing nutritionally insignificant volumes of enteral substrate to compromised infants in order to stimulate and supply nutrients to the developing gastrointestinal system.

Minimal enteral nutrition stimulates gut hormones, promotes structural and functional intestinal maturation, decreases indirect hyperbilirubinemia and cholestatic jaundice. TF supports gastrointestinal disaccharidase activity, blood flow and microbial flora. Clinical benefits include improved feeding tolerance, better weight gain, improved bone mineralization, reduced systemic sepsis and shorter hospital stay; moreover minimal enteral feeding facilitates a smooth and rapid transition from parenteral to enteral nutrition. Nevertheless several studies showed beneficial effects, results could not be confirmed in a meta-analysis [1]. On the other hand, it is important to emphasize that metaanalysis did not suggest any harmful effects and no increased incidence of necrotizing enterocolitis, while lack of enteral nutrition causes gut atrophy and bacterial translocation [2].

Despite considerable research, there are several outstanding questions regarding TF: how the timing of introduction and the rate of progression of enteral feeding may affect clinical outcome? Which babies should be treated? What is the optimal duration and volume? However, the following recommendations can be made on the basis of the published studies. Almost all the very low birthweight infants unable to tolerate substantial milk feeds, should be considered for TF. Exclusions are infants with necrotizing enterocolitis or congenital gastrointestinal abnormalities, such as gastrochisis. As delaying feeding appears to confer no advantage, it is reasonable to start TF on day 1 or 2 of life, providing the infant is stable. It appears that 0.5-1 ml/kg/h is a safe and effective volume. The optimal duration of TF is difficult to be recommended, and rather than specify a set time, regardless of clinical status, it is probably more sensible to suggest continuing TF until the infant can safely tolerate substantial volumes of milk. Breast milk, if available, should be preferred to formula [3].

References
Parenteral nutrition (PN) is life saving for many preterm infants and other neonates with severe illness, but prolonged use of PN can lead to intrahepatic cholestasis, referred to as parenteral nutrition–associated cholestasis (PNAC). It is defined as direct bilirubin greater than 2.0 mg/dL persistent for at least 2 consecutive tests during the administration of PN, not associated with other known causes of cholestasis [1-3]. With the increasing survival of preterm infants and neonates requiring intensive care, PNAC has become a more common clinical challenge. The incidence of PNAC vary widely depending on the population studied, with high incidencein populations carrying several risk factors for PNAC. It increases with duration of PN and ranges from 10% to 85% in infants [4-8].

A multifactorial aetiology has been proposed for the development of PNAC. Recognized risk factors for PNAC include low birth weight, low gestational age, necrotizing enterocolitis, intestinal malformations, and intestinal surgery. A further risk factor is the occurrence ofsevere infections, due to the requirement for central line for infusion of PN, and bacterial overgrowth caused by enteralstarvation and immature immune function [9-13].

However, exposure to PN is demonstratedas the main factor in the development of PNAC. Intravenous hyper-alimentationhas been implicated, such as the totalcocal overload, the quality of aminoacid solutions, the cumulative amount and the quality of lipid infusion, the presence of excessivealuminum in the PN solution, and the highmanganese intake with PN [1,14-17]. Ursodeoxycholic acid, cyclic PN, light protection for PN, tapering the soybean-based lipid emulsion, and antibiotics to decontaminate bacterial overgrowth are used to treat PNAC [18-21]. In recent years, increasing attention has been paid to the lipid content in PN. It has been found that fish oil–containing lipid emulsions could be useful in infants to reverse PNAC for whom enteral feeding is intolerable. However, no evidence supports the use of fish oil–containing lipid emulsions to prevent PNAC in neonates, including preterm infants [22].

Enteral feeding remains the best strategy to reverse and prevent PNAC, with as little as 10% of caloric intake showing beneficial effects [5,22].

References
extraction of implicit rules, and putting specific bits of basic experiences in context to generalise them. The aim of this lecture is to focus on methods of simulation on neonatal stabilization and transport (more than on medical procedures themselves). Simulation retraining for medical (or nurse) stuff should be based on the andragogic approach: adults are conscious of their own educational needs and focus their own attention on specific interests (related to daily practice) [6]. This methodological approach needs that teachers behave as peers towards learners, with empathy and a collaborative attitude.

A precious additive methodological element is fun: the serious medical game is the approach to optimize technical memories trough emotions [5]. In our experience, materials for simulation are daily clinical devices and innovative stuff developed by a multidisciplinary collaboration [7]; we discuss published guidelines (e.g. STABLE Program) and participants’ experiences.

As regards neonatal stabilization and transport, we perform: i) annual retraining sessions for all the operators in our Unit, ii) low and medium fidelity simulation sessions for nearby hospitals, iii) high fidelity sessions for colleagues working at geographically uncomfortable hospitals (i.e. island) and so needing for transport by helicopter, as a kind of “full scale CRM (Crisis Resources Management”).

In our opinion the traditional approach to teaching is inadequate for retraining of adult professionals. We propose simulation as the method to deepen knowledge, strengthen abilities and so optimize performances. Recording sessions and analysing them to discuss behaviours is a main instruments for debriefing. Every kind of support (e.g. e-learning platforms, paperuy stuff, pocket memory materials, etc) is admitted and should be creatively promoted.

References

A7 Hypoglycemia and hyperglycemia in extremely low-birth-weight infants

Maria Pia De Carolis1*, Serena A Rubortone1, Carmen Cocca1, Giovanni Pinna1, Eloisa Tiberi1, Zecca Enrico1, Costantino Romagnoli1, Silvia Salvi1, Sara De Carolis2
1 Division of Neonatology, Department of Obstetrics, Gynecology and Paediatrics, Catholic University of the Sacred Heart, Rome, 00168, Italy;
2 High Risk Pregnancies Division, Department of Obstetrics, Gynecology and Paediatrics, Catholic University of Sacred Heart, Rome, 00168, Italy. E-mail: mpsi.decarolis@rm.unicat.it


A6 Does it exist pulmonary hypertension in the ELBW infants?

Carlo Dani

Department of Neuroscience, Psychology, Drug Research and Child Health, Careggi University Hospital of Florence, Italy
E-mail: c.dani@unifi.it


Pulmonary hypertension (PH) of the newborn is a severe complication that occurs more frequently in term infants but can be demonstrated also in preterm infants. The incidence of PH in preterm infants is currently unknown because it is often masked by the contemporary respiratory distress syndrome (RDS), there are not important echocardiography studies in the early transitional period assessing the presence of PH in this population, and its echocardiographic diagnosis is not always simple. Similarly to term infants, PH in preterm infants can result from an abnormal transition from fetal to neonatal life (persistence of fetal circulation) but more frequently complicates RDS, or is secondary to the abnormal lung growthcaused by maternal pregnancy diseases, such as preterm premature rupture of membranes (PPROM) and oligohydramnios or, finally, is associated to bronchopulmonary dysplasia (BPD). On the other hand, it has been recently demonstrated that early PH occurring in association with severe SIDS is a risk factor for late PH and BPD in preterm infants.

The first choice drug for the PH of the newborn is inhaled nitric oxide (iNO), but its effectiveness in preterm infants is highly debated. American Academy of Pediatrics in 2014 reported that previous studies indicate that neither rescue nor routine use of iNO improves survival in preterm infants with respiratory failure. However, preterm infants with echocardiographic diagnosis of PH have not been specifically evaluated in previous studies and it is possible that they represent a subgroup with different response. Interestingly, milrinone has been recently found to be effective in improving oxygenation of preterm infants with PH refractory to iNO.

In conclusion, it seems that PH actually exists in extremely low birth weight infants, and that many efforts are needed to improve their finding and their treatment.

References

Background: Glucose metabolism disorders are common in extremely low birth weight (ELBW) infants and are associated with high morbidity and mortality [1-9]. This study was conducted to evaluate the prevalence and risk factors associated with both hypo and hyperglycemia in ELBW infants.

Materials and methods: All inborn ELBW neonates admitted to our NICU during a 5-year period were eligible for this retrospective analysis. Exclusion criteria were: birth weight (BW) <400 grams, major congenital malformations, death during the first 24 hours of life. Hypoglycemia was defined as blood glucose level (BGL) ≤45 mg/dL, hyperglycemia as BGL ≥240 mg/dL in a single determination or >180 mg/dL in two determinations at 2-hour intervals. Continuous intravenous insulin infusion was started after an ineffective glucose restriction.

Results: Of 195 ELBW infants, 29 (14.8%) were excluded and 166 (GA 26.7 ± 1.8 weeks, BW 751 ± 152 grams) were analyzed and grouped to their BGL. Normoglycemia was observed in 79 neonates (47.6%) (N-Group); 80 neonates (52.4%) showed abnormal BGL: 21 (12.7%) were hypoglycemic (Hypo-Group), 53 (31.9%) hyperglycemic (Hyper-Group) and 13 (7.8%) showed both hypoglycemia and hyperglycemia (Hypo&Hyper-Group). Clinical characteristics of the groups are reported in Table 1. Hypo-Group respect to N-Group showed a higher rate of small for gestational age (SGA) neonates (p = 0.03), Hyper-Group in comparison to N-Group showed a tendency toward a lower GA (p = 0.05), lower BW (p < 0.001), higher sepsis rate (p < 0.001), higher rate of treatment with inotropic agents (p = 0.02), corticosteroids (p = 0.006) and nonsteroidal antiinflammatory drugs (p = 0.01), Hypo&Hyper-Group respect to N-Group showed similar GA, lower BW (p < 0.001), higher sepsis rate (p < 0.01), higher rate of inotropic treatment (p = 0.04). Insulin was administered in 35 neonates (66%) of Hyper-Group and in 8 neonates (61.5%) of Hypo&Hyper-Group. Intraventricular Hemorrhage (IVH) rate was higher in Hyper-Group and Hypo&Hyper-Group respect to N-Group (p = 0.002) as well as IVH grade (p = 0.001 and p = 0.02, respectively). The rate of both Retinopathy of Prematurity (ROP) and ROP ≥stage 2 in survived neonates was higher in Hyper-Group respect to N-Group (p = 0.008 and p = 0.002, respectively). Mortality was similar among the groups (Table 2).
Among ELBW infants, hypoglycemia occurs more frequently than in other preterm infants [1]. The incidence of hypoglycemia depends on the definition used, ranging from 30 to 80% [2]. The risk of hypoglycemia is higher in ELBW infants compared to preterm infants with a birth weight of 1000-1500 g [3]. Hypoglycemia is more common in sick neonates, especially those with sepsis, respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), and necrotizing enterocolitis (NEC) [4].

Continuous glucose monitoring recently used in neonates [5] might be a useful tool for monitoring glucose changes also in ELBW neonates. A new robotic technology, called ivSTATION® (Health-Robotics) and developed specifically for the preparation of injectable ready to administration, was introduced in our NICU to simplify the therapeutic administration of the doses somministrate [6]. The literature reports that the risks of medical errors are related to the vulnerability of the neonatal population and the use of drugs quantified, in some cases, up to 26.90% [7]. The complexity of the Neonatal Intensive Care Unit (NICU), the patient as regards security, as explained in Art. 29 of the Code of ethics of nurses [8]. Patient safety is a priority worldwide. According to the WHO medical errors increase the risk of medical errors [9].

Conclusions: Among ELBW infants, hypoglycemia occurs more frequently in SGA neonates, while hyperglycemia alone or a marked variability of BGL (hypo and hyperglycemia) is more common in sick neonates. High rate of glucose homeostasis disorders highlights the importance of carefully monitoring BGL in order to prompt management. Continuous glucose monitoring recently used in neonates [10] might be a useful tool for monitoring glucose changes also in ELBW neonates.

Table 1 (abstract A7) Demographic data and risk factors in the study groups

<table>
<thead>
<tr>
<th></th>
<th>N-Group N=79</th>
<th>Hypo-Group N=21</th>
<th>Hyper-Group N=53</th>
<th>Hypo&amp;Hyper-Group N=13</th>
</tr>
</thead>
<tbody>
<tr>
<td>GA (wks), mean±SD</td>
<td>26.8±2.0</td>
<td>27.2±2.4</td>
<td>26.1±2.1</td>
<td>26.8±1.8</td>
</tr>
<tr>
<td>BW (g), mean±SD</td>
<td>808±136</td>
<td>719±140</td>
<td>695±146</td>
<td>692±140</td>
</tr>
<tr>
<td>Male, n (%)</td>
<td>17 (21.5)</td>
<td>10 (47.6)</td>
<td>26 (49.0)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>SGA, n (%)</td>
<td>22 (27.8)</td>
<td>11 (52.3)</td>
<td>16 (30.1)</td>
<td>4 (30.7)</td>
</tr>
<tr>
<td>Apgar &lt;6, n (%)</td>
<td>39 (49.3)</td>
<td>9 (42.8)</td>
<td>34 (64.1)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>Apgar &lt;6, n (%)</td>
<td>8 (10.1)</td>
<td>0</td>
<td>9 (16.9)</td>
<td>2 (15.3)</td>
</tr>
<tr>
<td>Intubation, n (%)</td>
<td>47 (59.4)</td>
<td>11 (52.3)</td>
<td>37 (69.8)</td>
<td>10 (76.9)</td>
</tr>
<tr>
<td>Antenatal Steroid, n (%)</td>
<td>64 (81.0)</td>
<td>17 (80.9)</td>
<td>41 (77.3)</td>
<td>12 (92.3)</td>
</tr>
<tr>
<td>RDS, n (%)</td>
<td>66 (83.5)</td>
<td>19 (90.4)</td>
<td>49 (92.4)</td>
<td>13 (100)</td>
</tr>
<tr>
<td>Sepsis, n (%)</td>
<td>16 (20.2)</td>
<td>4 (19.0)</td>
<td>32 (60.3)</td>
<td>7 (53.8)</td>
</tr>
<tr>
<td>Inotropic Agents, n (%)</td>
<td>26 (32.9)</td>
<td>6 (28.5)</td>
<td>28 (52.8)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>Xanthines, n (%)</td>
<td>70 (88.6)</td>
<td>20 (95.2)</td>
<td>50 (94.3)</td>
<td>13 (100)</td>
</tr>
<tr>
<td>Postnatal Steroid, n (%)</td>
<td>11 (13.9)</td>
<td>3 (14.2)</td>
<td>18 (33.9)</td>
<td>3 (23.0)</td>
</tr>
<tr>
<td>NEC, n (%)</td>
<td>6 (7.5)</td>
<td>2 (9.5)</td>
<td>5 (9.4)</td>
<td>4 (30.7)</td>
</tr>
<tr>
<td>Surgical Procedures, n (%)</td>
<td>34 (43.0)</td>
<td>8 (38.0)</td>
<td>34 (64.1)</td>
<td>9 (69.2)</td>
</tr>
</tbody>
</table>

Table 2 (abstract A7) Complications and outcome in the study groups

<table>
<thead>
<tr>
<th></th>
<th>N-Group N=79</th>
<th>Hypo-Group N=21</th>
<th>Hyper-Group N=53</th>
<th>Hypo&amp;Hyper-Group N=13</th>
</tr>
</thead>
<tbody>
<tr>
<td>IVH, n (%)</td>
<td>17 (21.5)</td>
<td>7 (33.3)</td>
<td>25 (47.1)</td>
<td>8 (61.5)</td>
</tr>
<tr>
<td>IVH (grade 3, n (%))</td>
<td>5 (6.3)</td>
<td>1 (4.7)</td>
<td>15 (28.3)</td>
<td>4 (30.7)</td>
</tr>
<tr>
<td>ROP all stages in the survivors, n (%)</td>
<td>49 of 61 (80.3)</td>
<td>10 of 16 (62.5)</td>
<td>35 of 35 (100)</td>
<td>7 of 8 (87.5)</td>
</tr>
<tr>
<td>ROP &gt; stage 2 in the survivors, n (%)</td>
<td>35 of 71 (57.3)</td>
<td>9 of 16 (56.2)</td>
<td>35 of 35 (100)</td>
<td>6 of 8 (75)</td>
</tr>
<tr>
<td>Mortality, n (%)</td>
<td>18 (22.7)</td>
<td>5 (23.8)</td>
<td>18 (33.9)</td>
<td>6 (46.1)</td>
</tr>
</tbody>
</table>

IVH: Intraventricular Hemorrhage; ROP: Retinopathy of Prematurity

Conclusions: Among ELBW infants, hypoglycemia occurs more frequently in SGA neonates, while hyperglycemia alone or a marked variability of BGL (hypo and hyperglycemia) is more common in sick neonates. High rate of glucose homeostasis disorders highlights the importance of carefully monitoring BGL in order to prompt management. Continuous glucose monitoring recently used in neonates might be a useful tool for monitoring glucose changes also in ELBW neonates.

References

A8
Therobotat the sideof the nurse: present situation and prospects
LauraDel Mastro*, Laura Plevani, Giacomo Cavallaro, Fabio Mosca Neonatal Intensive Care Unit, Department of Clinical Sciences and Community Health, Fondazione IRCCS Cà Granda, Ospedale Maggiore Policlinico, University of Milano, Italy
E-mail: l.delma@libero.it

Patient safety is a priority worldwide. According to the WHO medical errors involve 1 in 10 patients, providing damage or injury, including standing up to cause death [1]. Even the nurses can not refrain from protecting the patient as regards security, as explained in Art. 29 of the Code of ethics of nurses [2]. The complexity of the Neonatal Intensive Care Unit (NICU), the vulnerability of the neonatal population and the use of drugs “off-label” increase the risk of medical errors [3].

The literature reports that the risks of medical errors are related to the preparation of injectable drugs, quantified, in some cases, up to 26.90% (!) of the doses. The increase in the risk of medical errors [4].

A new robotic technology, called ivSTATION® (Health-Robotics) and specifically developed for the preparation of injectable ready to administration, was introduced in our NICU to simplify the therapeutic...
processin the preparation stage, to optimize resources and times and especially to enhance the security. ivSTATION® is able to reconstitute powdered drugs, to obtain dilutions specifications, to verify doses prepared before making them available and to provide them with a label containing all the information required. The therapy is prepared in an aseptic environment ISO 8 equipped with HEPA filters 14. The unit is equipped with UV lamps that contribute to the microbiological control overnight. ivSTATION® provides total traceability of information about each preparation produced, making it possible to extract all the time both data specific to a single preparation and general data to be used for statistical analysis. Once the drug is prepared, it appears on the medical record through a symbol, allowing the nurse to proceed with the implementation of the successive phases of the therapeutic process, in strict observance of safety rules. The integration of the robot in the preparation of the therapies, associated with the system of the therapeutic process with the computerized system “bar code”, allows a considerable decrease of the risk in both the preparation phase of identification of the patient, which are known to where the errors are hardly detectable [6,7].

This technology is a useful tool for limiting the error and the iatrogenic clinical risk associated with medical therapy. The nurse, in charge of patients, has the opportunity, with the use of this technology, to spend more time during carepro.

References
2. 2009.

IA9
Invasive arterial blood pressure in the neonatal intensive care: a valuable tool to manage very ill preterm and term neonates
Michelina Dí Basi*, Anna Casani, Luigi Orfeo
Neonatal Intensive Care Unit, Maternal and Child Health Department, Rummo Hospital Benevento, Italy
E-mail: michela-db@libero.it

Blood pressure monitoring is essential in managing hemodynamically unstable neonates and preterm infants. Non-invasive blood pressure measurement (NIBP) with oscillometric technique is in widespread use in the Neonatal Intensive Care Units (NICUs). Nonetheless NIBP is not pretty accurate when compared with invasive monitoring since it generally over reads mean blood pressure in particular when the infants are hypotensive so it falsely reassures neonatologists [1-4]. Invasive arterial blood pressure (IABP) methods is considered the gold standard for circulatory management of ill neonates [5]. Along with the more accuracy, IABP measurement has a number of advantages over NIBP, namely it allows beat-to-beat pressure measurement to closely monitor patients with very changeable conditions, arterial blood sampling is easily performed as well as cardiac stroke volume can be derived from characteristics of the arterial pressure pulse. The commonly used method is by means of an umbilical artery catheter, wherever possible, or by placing a cannula needle in a different artery, usually radial [5-8]; a column fluid directly connects the arterial system to a pressure transducer where the arterial pulse is converted into an electrical signal that in turn will be processed via a microprocessor, amplified and eventually displayed as the blood pressure waveform against time [5]. In order to ensure a reliable assessment of blood pressure nurses should be wary about one of the commonest sources of error, namely introduction of small air bubble in the system [5]. Thrombo-embolism, vasospasm, thrombosis, haemorrhage and infection are complications of arterial cannulation [9]. Haematoma and peripheral nerve injury may also occur in case of peripheral cannulation. A close supervision by nurses encompasses observation for adequate patent of artery by monitoring hourly colour, temperature and perfusion of digits and limbs. Blanching, redness, cyanosis and changes in temperature must be quickly reported to the medical staff. Severe bleeding as result of disconnected arterial line required a strict monitoring as well. In addition nursing management consists in performing level and zero arterial line at the beginning of every shift and every time the neonate is turned or moved. The heparinized saline infusion should be changed every 24 hours and the infusion line every third day [10-15].

In conclusion invasive arterial blood pressure technique, if correctly performed by neonatologists and closely monitored by nurses, represents a valuable tool to tailor treatment in very ill preterm neonates.

References
Our little Neonatal Intensive and Pathology care centre (T.I.N.) with "preterm infants not many but very important ones" welcomed pathological and premature infants. In Italian born around 500/540 thousand children a year, 7.5% of these infants are born before 37 weeks Gestational Age (G.A.) and 2% with very low birth weight and severe prematurity. The mechanical ventilation, the parenteral feeding, the diagnostic/therapeutic methods and the maternal milk have increased the survival of these small babies. Today we know that the baby, even if extremely premature, feels pain and that perception is stronger if G.A. at birth is lower. Therefore in our T.I.N., the professional care is addressed to humanization, clinical treatments, very important part of "right to life, but above all of "right to the best quality of life". From warm and comfortable mother's womb to T.I.N.environment, premature infants experiecen unknown world made of lights, sounds, smells and knowpain, solitude, the contact with different hands, jeopardizing the normal maturation process of his brain function. Therefore, in our T.I.N., since the nineties visual and acoustic stimuli have been minimized giving great importance to postural control. The basic element of the harmonious balance and proper movement, with the help of little nests inside the incubator in order to protect and content the baby looking forward to the "kangaroo mother care". Later in 2004, we integrated the protocol of care with and without analgesia and pharmacological (sensorial satucration). In the last decade, in our department there were technical improvements that formed the group of newborn pain with operators always updated and representatives in each round. Infants were treated following the directions of the Group of Study of Pain of Italian Society of Neonatology implementing, especially, the use of pain scales; in fact, a good pain management can not ignore the above. In everyday life has become part of our team a physical therapist specializing in Italian Association of Infant Massage and a psychologist. Also important is the presence of representatives of "breastfeeding" to inform and encourage the mothers of the little ones about the importance of breast milk. Last but not least the opening day of the T.I.N. parents.

References

A11
Home discharge and management in severe DBP patient
Patrizio Fiorini
Neonatal Intensive Care AOU Meyer Firenze, Italy
E-mail: patrizio.fiorini@meyer.it

Bronchopulmonary dysplasia (DBP) is the most common sequela related to very low birth weight, has a multifactorial aetiology and first characterized by Northway(1967), now unlike the original form of the disease, now forms in the group of newborns who may have needed little or no ventilator support, and have had low inspired oxygen concentration during early postnatal days. “New” DBP affects newborn with gestational age very low, could be the result of impaired lung growth (impaired alveolar or vascular growth). Affects about 68% of newborn between 22 and 26 gestational weeks and about 25% of newborn weight >1500gr. New DBP is defined as oxygen dependence for at least 28 days after birth, depending on the degree of respiratory support at 36 weeks of postnatal age or at the discharge, the disease is classified as mild, moderate or severe. Home discharge of patient with severe DBP is considered if the following criteria are fulfilled: a- sustained weight gain for a long time; b- maintains a normal body temperature fully clothed in an open bed; c- shows competent suckle feeding without cardiorespiratory compromise; d- has not had a relevant apnea, bradycardia, or oxygen desaturation for at least five days prior to discharge; e- demonstration of parental competence in all aspect of infant care; f- parental participation in a postnatal care program. Prior to discharge the parents are taught home resuscitation on the neonatal unit. They also receive a visit from the home oxygen nurse who discusses and gives training to the parents in the use of home oxygen. The equipment for domiciliary oxygen is a liquid oxygen system (pressurize gas cylinders, concentrators) comprising a storage vessel and a small portable vessel which can easily filled. The oxygen is supplied with a low-flow-meter via mono or binasal canula. A pulse oximeter is prescribed to monitor SaO2 and cardiac frequency. Optimal SaO2 targets have to be further investigated by controlled studies but actually is > 93%. One the most challenging aspects of the treatment of DBP is the management of ventilator assisted children and tracheostomy in the home. Caregivers are trained in emergency procedures including CPR, tracheostomy changes and manual ventilator. Maintenance of oxygenation and proper nutritional support are critical aspects in the post-discharge management of these infants as immunization and neurodevelopmental follow-up.

References

A12
Italian immunization calendar: rationale and schedule
Gabutti Giovanni , Kushiari Panvan, Stefani Af Armando
Department of Medical Sciences, University of Ferrara, Ferrara, Italy
E-mail: giovanni.gabutti@unife.it

Vaccines are a great scientific conquest of the modern era having made it possible to prevent many infectious diseases that previously had a significant impact on the population both in terms of morbidity and sequelae and/or lethality. They act respecting/enhancing physiological capabilities of the organism and have a very favorable pharmacoeconomic profile. The development and availability of a safe, well-tolerated and effective vaccine is the indispensable premise for the primary prevention through vaccination in the community. Then it is necessary to define the target to be pursued; this latter can be control, elimination and eradication. The choice of the target is influenced by several factors; however, it must be followed by the development of an appropriate strategy to achieve the necessary vaccine coverage rate. The vaccination schedule is therefore the instrument by which each vaccine strategy is planned, and should take into account some epidemiological, immunological and practical requirements (Table 1) [1]. The immunization schedule is therefore the chronological sequence of each vaccination; it is an essential tool to achieve established targets as well as a useful guide for any stakeholder (e.g. health care professionals, users, etc.). The current vaccine schedule results from a series of laws relating to compulsory vaccinations and has been integrated over time by including recommended immunizations [2]. A key point is that the schedule should be a flexible instrument and continuously updated. The Italian immunization schedule has many positive aspects as it is updated based on the availability of new vaccines, combines mandatory and recommended immunizations (stressing in this way the relevance of both types of vaccinations), is structured so that it can be integrated in case of new epidemiological requirements and covers all age groups. Besides, it
includes vaccines considered of priority from the public health point of view and for this free of charge and actively offered.

Concerning the paediatric age, particularly the first year of life, the definition of the schedule should take into account the development of the immune system, the clearance of maternal antibodies, the typical age of acquisition of infection, the possible age-related complications of a disease, the possible side effects of immunization according to age of immunization, the duration of elicited immune protection, the number of appointments for vaccination sessions and the accessibility to vaccination services. The scientific societies SItI and SIP, together with FIMP and FIMMG, has approved the "2014 Lifetime Immunization Schedule" (Table 2) [3].

### Table 1 (abstract A12) Immunizations schedule: main factors that should be taken into account

<table>
<thead>
<tr>
<th>Epidemiological factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Typical age of acquisition of the disease (immunization should come first)</td>
</tr>
<tr>
<td>• Possible age-related complications of the disease</td>
</tr>
<tr>
<td>• Age-related adverse events of immunization</td>
</tr>
<tr>
<td>• Already implemented immunization programs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Immunological factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Immune system development</td>
</tr>
<tr>
<td>• Clearance of maternal antibodies</td>
</tr>
<tr>
<td>• Number of doses and time interval between doses necessary to obtain an effective immune response</td>
</tr>
<tr>
<td>• Duration of immune protection elicited by immunization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Number of immunizations to be included in the schedule</td>
</tr>
<tr>
<td>• Availability of combined vaccines</td>
</tr>
<tr>
<td>• Number of vaccination sessions</td>
</tr>
<tr>
<td>• Organization of immunization services</td>
</tr>
</tbody>
</table>

### Table 2 (abstract A12) 2014 Lifetime Immunization Schedule up to 15 months of age (SItI, SIP, FIMP, FIMMG) (modified from ref. 3)

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>0-30 days</th>
<th>3 months</th>
<th>4 months</th>
<th>5 months</th>
<th>6 months</th>
<th>7 months</th>
<th>11 months</th>
<th>13 months</th>
<th>15 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTPa</td>
<td>DTaP</td>
<td>DTaP</td>
<td>DTaP</td>
<td>IPV</td>
<td>IPV^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPV</td>
<td>IPV</td>
<td>IPV</td>
<td>IPV</td>
<td>IPV</td>
<td>IPV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBV</td>
<td>HBV</td>
<td>HBV</td>
<td>HBV</td>
<td>HBV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hib</td>
<td>Hib</td>
<td>Hib</td>
<td>Hib</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCV</td>
<td>PCV13</td>
<td>PCV13</td>
<td>PCV13</td>
<td>PCV13^</td>
<td>PCV13^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMRV</td>
<td>MMRV^</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMR</td>
<td>MMR§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Varicella</td>
<td>V§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men C</td>
<td>Men B</td>
<td>Men B</td>
<td>Men B</td>
<td>Men B§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men B</td>
<td>Men B</td>
<td>Men B</td>
<td>Men B</td>
<td>Men B§</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPV</td>
<td>Flu°°</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Rotavirus##</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAV</td>
<td>HAV##</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HAV##</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

^ a fourth dose has to be provided at 5-6 years of age; for the fourth dose DTaP could be used instead of DTaP if a high coverage rate is guaranteed

* newborns from HBaAg positive mother; co-administration of IgG at birth

^ children starting immunization during the second year of life should receive two doses. One dose in the case of immunization started in the third year of life. One dose of PCV13 is recommended for unimmunized children or for those who have been immunized with PCV7. Two doses are recommended for children at risk

§ a second dose has to be provided at 5-6 years of age

** a second dose is recommended at 12-14 years of age: in subjects at risk immunization could start at 3 months of age (3rd dose after one year of age)

§§ schedule 3+1 in newborns; the fourth dose at 13-15 months of age

### References

2. Conferenza Permanente per i Rapporti tra lo Stato, le Regioni e le Province Autonome di Trento e Bolzano - Intesa 22 febbraio 2012 'Piano Nazionale Prevenzione Vaccinale 2012-2014'. Repertorio atti n. 54/CSR, GU n. 60 del 12-3-2012 - Suppl. Ordinario n. 47.

### Lung recruitment strategies

Paolo Gancia*, Giulia Pomero
Terapia Intensiva Neonatale-Neonatologia, ASO S. Croce e Carle, Cuneo, Italy
E-mail: paologancia@gmail.com
Mechanical ventilation in newborns, children and adults leads to lung injury and has been shown to induce the formation of proteinaceous lung oedema causing epithelial disruption and resulting in changes in lung perfusion. Lung injury leads to reduced compliance, worsening of shunt fraction and an inflammatory response that results from high-end inspiratory transpulmonary pressures (Ptp) and inadequate End Expiratory Lung Volume (EELV). Lung injury results if a lung is ventilated from collapsed state with each ventilator cycle. Thus the first concept of treatment in acute hypoxic respiratory failure is: “Open collapsed lung units and keep them open without overdistending them”. The open lung is one in which there is little or no atelectasis and an optimal gas exchange. Lung recruitment strategy transiently increase Ptp to reopen the alveolar units not aerated or poorly aerated but recruitable.

Lung recruitment manoeuvres may restore EELV resulting in more stable alveoli, and reduce shear stress associated with the alveolar cyclic opening and closing. Lung recruitment can be performed in several ways: in delivery room with a T-piece device, in the NICU setting by using a conventional or high frequency oscillation (HFO) ventilator, and is commonly achieved by increase of end-expiratory lung volume with positive end expiratory pressure (PEEP) or end inspiratory lung volume by inspiratory holds or sustained inflation. Recruitment during both, HFO and CMV (Conventional Mechanical Ventilation), follows similar concepts when using small tidal volume ventilation but is easier to achieve at bedside during HFO. The Sustained Inflation maneuver (SI) applies a high pressure to the lung for a short period (30 sec) before returning to previous mean airway pressures. This volume recruitment strategy has been shown to be as protective as high frequency oscillatory ventilation (HFO) at similar lung volumes. Infants treated with a SI in delivery room had improved short-term respiratory outcomes (reduced need of tracheal intubation and mechanical ventilation), but major outcomes (BPD Bronchopulmonary dysplasia-and/or death) were not improved. Recent reports describe improvements in arterial oxygenation with the use of recruitment maneuvers during CMV and/or HFO. However, the impact of these strategies on patient important outcomes such as survival is still unclear.

Further clinical studies are needed to evaluate the efficacy of SI, including selection of patients, setting of SI maneuver in terms of duration and peak pressure, timing of surfactant administration. Further studies are also needed to elucidate the impact of recruitment maneuvers during mechanical ventilation, including survival and BPD.

References

Maternal voice and preterm infants development
Giancarlo Gargano, Francesca Nuccini
Neonatologia e Terapia Intensiva Neonatale, Arcispedale S. Maria Nuova - IRCCS, Reggio Emilia, Italy
E-mail: giancarlo.gargano@asmn.re.it

Mother’s voice seems to have an important role in neurological development of the fetus and the newborn. Numerous studies have shown that the fetus perceives sounds and reacts to them since 26th–28th week of gestation and that he has the ability to discriminate between the maternal voice and other voices, showing a marked preference to the first [1,2]. The fetus within the uterus is in a sound environment, called “noise floor”, resulting from the combination of “internal noise”, such as the sound of maternal heartbeat, breathing and gastrointestinal activity, and “external noise”, principally the mother’s voice.

Premature birth abruptly stops prenatal learning experiences and it causes a sudden transition from the quiet and lovely environment of the maternal womb, towards the noisy world of the NICU, often hostile and aggressive [3]. During the months in NICU, the baby is deprived of the biological maternal sounds and this could interfere with his neurodevelopment, in particular speech and language acquisition. The Developmental Care programs aim to provide an extra-uterine environment similar to the maternal womb: control of light, noise, pain, postural care, kangaroo mother care are examples. Few studies addressed the beneficial effects of the early exposure to the mother’s voice and recently some researches have shown that this sound can increase cardiorespiratory stability and growth, improve deep sleep, and shorten length of hospital stay [4-8]. In 2013 Loewy [9], using several acoustic stimuli, has shown that exposure to “intrauterine” stimuli and in particular to the mother’s voice, meant an increased attention span and alertness, associated with a marked reduction in heart rate, increased stability of behavioral states and sleep quality and improved nutritional behavior and caloric intake. Chorna et al. [10], using mother’s voice played through a Pacifier-Activated Music player (PAM) during non-nutritive sucking, have demonstrated an improvement of the development of sucking ability and oral feeding skills in preterm infants. Finally Picciolini et al. [3] have shown that early exposure to maternal voice, administered by bone conduction, according Tomatis’ method, exerts a beneficial effect on preterm infants autonomic system and neurobehavioral development. They have found a better neurofunctional assessment score at 3 months of corrected age vs a control group. In conclusion, studies show encouraging results about mother’s voice ability to promote optimal neurological development of preterm babies. We are studying the effects of the voice on mother-child attachment and its correlations with neurodevelopment outcomes.

References

Maternal voice and preterm infants development
Giancarlo Gargano, Francesca Nuccini
Neonatologia e Terapia Intensiva Neonatale, Arcispedale S. Maria Nuova - IRCCS, Reggio Emilia, Italy
E-mail: giancarlo.gargano@asmn.re.it

Stabilization of the critically ill neonate awaiting transport
Maurizio Gente1, Domenico Di Lallo2, Francesco Franco3, Roberto Auferi4, Piermichele Paolillo5, Mario De Curtis6
1Department of Pediatrics and Infant Neuropsychiatry, Neonatal Emergency Transport Service, Sapienza University of Rome, Rome, Italy; 2Regional Health
Introduction: An appropriate stabilization before transport is essential to reduce adverse events [1-5]. The aim of this study was to describe the characteristics of a cohort of newborns transported and to evaluate the association between stabilization time and change of Transport Risk Index of Physiologic Stability (TRIPS score) [6].

Materials and methods: The database of the Neonatal Emergency Transport Service in Lazio Region and all newborns transported within May 2009-December 2012 were analyzed (N=2,331). A multinomial logistic regression model was used to study the association between stabilization time and improvement and deterioration in TRIPS score in reference to no change, adjusting for potential confounders. Mortality Index for Neonatal Transportation score (MINT) [7] was analysed but not included in the multivariate model due to the covariation with the TRIPS score. In order to evaluate the potential interaction with stabilization times, the data analysis was stratified by perinatal level of care (I, II, III). Two-tailed p-values were considered at 5% significance level.

Results: Table 1 shows descriptive statistics of transport characteristics by birth centre level. Median GA was 36 weeks and 6.6% had less than 28 weeks. Median age at transport was 4.9 hours. The most frequent diagnosis was respiratory diseases in all birth centre levels (52% overall). Mean MINT score was 3.1 and increased from 1.4 to 5.4 across the three levels of care. Median stabilization times were 25 minutes in level I and III, and 30 in level II. Overall, median pre-transport TRIPS score was 6; the highest mean value was observed in level III units (11.7). Overall, 72.9% of all infants showed no TRIPS score change, 22.7% an improvement, and 4.4% a deterioration (4.9% in level III). Figure 1 shows the results from multinomial regression analysis of improvement and deterioration in TRIPS score in reference to no change. An association between stabilization time and TRIPS change was observed, depending on the level of the centre: an increase in stabilization time was associated with increased odds of deterioration (+48% for 1 SD increase, 21.6 minutes) in level I; by contrast, an increase in stabilization time was associated with increased odds of improvement (+49%) in level III. Both effects were observed in level II units.

Table 1(abstract A15) Infants characteristics by perinatal level of care. Lazio, 2009-December 2012

<table>
<thead>
<tr>
<th>Birth centre level</th>
<th>I N=966</th>
<th>II N=651</th>
<th>III N=714</th>
<th>Total N=2331</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gestational age (wks)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22-27 (%)</td>
<td>8 (0.8)</td>
<td>30 (4.6)</td>
<td>117 (16.4)</td>
<td>155 (6.6)</td>
</tr>
<tr>
<td>28-31 (%)</td>
<td>37 (3.8)</td>
<td>52 (8.0)</td>
<td>212 (29.7)</td>
<td>301 (12.9)</td>
</tr>
<tr>
<td>32-36 (%)</td>
<td>313 (32.4)</td>
<td>200 (30.7)</td>
<td>280 (39.2)</td>
<td>793 (34.0)</td>
</tr>
<tr>
<td>37+ (%)</td>
<td>608 (62.9)</td>
<td>369 (56.7)</td>
<td>105 (14.7)</td>
<td>1082 (46.4)</td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>37.0 (2.8)</td>
<td>36.1 (3.9)</td>
<td>31.9 (4.1)</td>
<td>35.2 (4.2)</td>
</tr>
<tr>
<td>Median</td>
<td>37</td>
<td>37</td>
<td>32</td>
<td>36</td>
</tr>
</tbody>
</table>

| **Age at transport (hours)** | | | | |
| Mean (SD) | 15.2 (16.8) | 15.0 (16.1) | 6.8 (11.2) | 12.6 (15.6) |
| Median | 6.6 | 6.9 | 3.1 | 4.9 |

| **Group of diagnosis/symptoms (%)** | | | | |
| Antenatal conditions | 194 (20.1) | 128 (19.7) | 312 (43.7) | 634 (27.2) |
| Respiratory | 511 (52.9) | 370 (56.8) | 340 (47.6) | 1221 (45.4) |
| Cardiovascular | 39 (4.0) | 29 (4.5) | 29 (4.1) | 97 (4.2) |
| Infectious | 53 (5.3) | 38 (5.8) | 6 (0.8) | 97 (4.2) |
| Hematologic | 66 (6.8) | 33 (5.1) | 5 (0.7) | 104 (4.5) |
| Other | 103 (10.7) | 53 (8.1) | 22 (3.1) | 178 (7.6) |
| MINTa | Mean (SD) | 1.4 (3.5) | 3.2 (5.5) | 5.4 (5.7) | 3.1 (5.2) |
| Median | 0 | 0 | 4 | 0 |

| **Birthplace (%)** | | | | |
| Municipality of Rome | 550 (56.9) | 175 (26.9) | 689 (96.5) | 1414 (60.7) |
| Other | 416 (43.1) | 476 (73.1) | 25 (3.5) | 917 (39.3) |

| **Stabilization time (minutes)** | | | | |
| Mean (SD) | 31.6 (20.0) | 39.6 (26.3) | 28.5 (17.2) | 32.9 (21.6) |
| Median | 25 | 30 | 25 | 30 |

| **TRIPS score pre** | | | | |
| Mean (SD) | 5.8 (7.4) | 9.6 (10.8) | 11.7 (11.3) | 8.7 (10.0) |
| Median | 5 | 6 | 6 | 6 |

| **TRIPS change (%)** | | | | |
| Deterioration | 40 (4.1) | 28 (4.3) | 35 (4.9) | 103 (4.4) |
| No change | 697 (72.2) | 445 (68.4) | 557 (78.0) | 1699 (72.9) |
| Improvement | 229 (23.7) | 178 (27.3) | 122 (17.1) | 529 (22.7) |

aThe Mortality Index for Neonatal Transportation was available for March 2010-December 2012
Hypothyroxinemia in extremely low birth weight infants

Paolo Ghirri, Francesca Dini, Sara Lunardi, Francesca Moscuzza, Antonio Boldrini
Neonatology and Neonatal Intensive Care Unit and Section of Neonatal Endocrinology and Dysmorphology, S. Chiara Hospital, University of Pisa, Italy
E-mail: pghirri@med.unipi.it

Italian Journal of Pediatrics 2015, Volume 41 Suppl 1: A16

Hypothyroxinemia of prematurity (HOP) is a transient alteration in thyroid hormone availability found in more than half of extremely low birth weight infants (ELBW) born at less than 30 weeks [1]. HOP is characterized by very low total T4 (TT4) and free T4 (FT4) levels with a normal or low thyroid stimulating hormone (TSH); TT4 and FT4 show a nadir at 7-10 days of life and they may remained low for the first 3-6 weeks of life depending from the severity of prematurity [2]. The reason for this hypothyroxinemia is multifactorial including the loss of maternal transfer of T4, immaturity of the hypothalamic-pituitary-thyroid axis, limited thyroid capacity to increase synthesis and metabolism, immaturity of peripheral tissue deiodination, reduced iodine availability and excessive losses, drugs affecting thyroid function and other adverse perinatal events [3]. Thyroid hormones are critical for a normal maturation of the developing brain in the fetus and infant, including cerebral neurogenesis, neural migration and differentiation, axonal and dendritic growth and synaptogenesis, gliogenesis, myelogenesis [4,5]. HOP has been associated with adverse neurodevelopmental outcomes such as deficits in developmental of motor, cognitive, language, memory, attention and it seem to be an independent risk factor for cognitive and behavioral deficits [6], however it is not clear the need to treat [7]. In a large trial of prophylactic thyroxine treatment van Wassenaer et al. [8]observed an 18-point improvement in mental development Bayley scores at 2 years postnatal age in infant born at less than 27 weeks gestation but, treated infants of more than 27 weeks had a 10-point deficit in Bayley scores. Overall there is insufficient evidence to determine whether use of thyroid hormones for treatment of preterm infants with transient hypothyroxinemia results in changes in neonatal morbidity and mortality, or reductions in neurodevelopmental impairments, but T4 supplementation may be beneficial in infants born at less than 27 weeks. Recently Scratch et al. [5], contrary to expectations, reported that in children born at less than 30 weeks’ gestation, higher concentrations of free thyroxine over the first 6 weeks of life were associated with poorer cognitive function at 7 years of age. Future studies should be directed in understanding unexpected endocrine patterns after very preterm birth.

References

1. La Gamma EF: Transient hypothyroxinemia of prematurity: 10 reports from our group. Semin Perinatol 2008, 32:377-446.

Figure 1(abstract A15) Association between stabilization time and Transport Risk Index of Physiologic Stability change: results of adjusted multinomial logistic regression models stratified by birth centre level. Lazio, May 2009-December 2012

A18 Pain control in newborn: pharmacological interventions
Paola Lago 1*, Anna Prielli 2, Daniele Merazzi 3, Elisabetta Garetu 4, Patrizia Savant Levet 5, Gina Ancora 6,7,8,9,10
1Woman’s and Child’s Health Department, Azienda Ospedaliero-Universitaria of Padova, Padova, Italy; 2MBBM Foundation, San Gerardo Hospital, Monza, Italy; 3Woman’s and Child’s Health Department, Valduce Hospital, Como, Italy; 4Woman’s and Child’s Health Department, Azienda Ospedaliero-Universitaria Policlinico di Modena, Italy; 5Mother’s and Child’s Health Department, Maria Vittoria Hospital, Torino, Italy; 6Mother’s and Child’s Health Department, Infermi Hospital, Azienda Ospedaliero-Rimini, Italy. E-mail: lago@pediatria.unipd.it

Background: Pharmacological interventions (PIs) are frequently used for pain control in newborn, particularly during respiratory assistance and in the postoperative period. However efficacy and safety of PIs are still not well demonstrated.

Material and methods: To assess efficacy and safety of PIs for procedural pain in neonate, a literature search covering the period 2000-2015 via Medline and Cochrane Library database, was undertaken. PIs were evaluated in relation to intubation (INT), mechanical ventilation (MV) and postoperative analgesia (POp) in preterm and fullterm infants. Efficacy of PIs in controlling procedural pain and distress was assessed on validated pain scores as PIPP, DAN, CRFES, EDIN etc. Safety of PIs was evaluated in relation to reduced morbidity and on the Adverse Effects (AEs) reported. The authors rated the level of evidence (LOE) and strength of recommendations, according with GRADE system.

Results: For tracheal intubation the efficacy of PIs in reducing stress and pain has been demonstrated for Remifentanil 2 mcg/Kg and Remifentanil 1 mcg/Kg or Fentanyl 1-2 mcg/Kg plus midazolam 100 mcg/Kg. (N. 6 studies and N.344 newborns-LOE ++/+++ [1,2]). In order to improve newborn’s stability and reduce the time of intubation, Propofol can be titrated at 1-2,5 mg/Kg in hemodinamically stable patient after the first 24 hours of life, or Fentanyl (F) administered at 2 mcg/Kg plus short half-life curare(N. 18 studies and N.1003 newborns-LOE ++/+ [3]. The use of opioids (F-or Morphine- M) in MV is effective in reducing the pain scores, however they may cause AEs as hypotension (M), prolonged ventilation, longer time to reach full enteral feeding (M&F) and adverse effects on neurodevelopmental outcome (M&F) in dose-dependent way: therefore they should be used selectively, when indicated by clinical judgment and evaluation of pain indicators (M 2 RCTs N. 1139 newborns, F 4 RCTs N.228 newborns-LOE++, Recommendation 1 [4,5]). In the postoperative period of major surgery, the use of opioids should be guaranteed at least in the first 48 hours (LOE++, Recommendation 1); Tramadol does not appear to offer advantages over F regarding the efficacy, the duration of MV and the time to reach full enteral feeding. (LOE++, Recommendation 1); [6] Intravenous Paracetamol may have an opioids-sparing effect and should be used in association with M or F (LOE++, Recommendation 1) [7] (Table 1).

Conclusions: PIs are effective in relieving pain and stress from procedural pain in newborn but they should be individualized and their effects monitored with validated pain scale to reduce the potential AEs.

References


A19

Optimal ventilation strategy
Gianluca Lista*, Azzura La Verde, Francesca Castoldi
Neonatal Department - Ospedale dei Bambini "V. Buzzi", Azienda ICP, Milano, Italy
E-mail: g lista@icp.mi.it

Premature delivery, is always associated to the failure of respiratory transition and a delayed achievement of an adequate functional residual capacity. For this reason preterm babies (especially the Extremely Low for Gestational Age -ELGA- infants) frequently need a respiratory support. Non-invasive ventilation (NIV) is widespread used in the management of respiratory distress even in ELGA infants without increasing of neonatal mortality or neurological impairment. The most recent meta-analysis and reviews on NIV approach demonstrated that NIV is a valid alternative to mechanical ventilation (MV) in the management of respiratory failure and resulted in significant reductions in the incidence of Bronchopulmonary dysplasia (BPD) amongst surviving infants [1,2]. Nevertheless, even if non-invasive respiratory support seems to be very efficacious in preterm babies, sometimes ELGA infants require MV. Pressure-limited ventilation is yet the standard mode in neonatal intensive care unit, because the attempts to use traditional volume-controlled ventilation it has been often impractical in very small preterm infants. Moreover pressure-limited ventilation continues to be the primary mode of ventilation in neonates because of its relative simplicity and ability to ventilate effectively despite large ETT leak. The major disadvantage of pressure-limited ventilation is that the tidal volume (VT) varies with changes in lung compliance (e.g after surfactant therapy). The consequences of such rapid improvements in compliance are inadvertent hyperventilation and lung injury from excessively large VT (volutrauma); inadvertent hyperventilation may induce hypocapnia, with

Table 1(abstract A18) Efficacy of Pharmacological Interventions in newborn

<table>
<thead>
<tr>
<th>Pharmacological Interventions</th>
<th>Level of evidence</th>
<th>Grade of Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioids</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fentanyl/ Fentanyl+ muscle relaxant</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Remifentanil</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Morphine</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td><strong>Anesthetics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ketamine</td>
<td>++</td>
<td>Non indication</td>
</tr>
<tr>
<td>Propofol*</td>
<td>++</td>
<td>Non indication</td>
</tr>
<tr>
<td>Tiopental*</td>
<td>++</td>
<td>Non indication</td>
</tr>
<tr>
<td><strong>Sedative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midazolam in association with opioids**</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Dexametomidine</td>
<td>Non indication</td>
<td>++</td>
</tr>
<tr>
<td><strong>Other weak analgesic</strong></td>
<td>Non indication</td>
<td>Non indication</td>
</tr>
<tr>
<td>Paracetamol**</td>
<td>Non indication</td>
<td>Non indication</td>
</tr>
<tr>
<td>Tramadol</td>
<td>Non indication</td>
<td>Non indication</td>
</tr>
</tbody>
</table>

Legend

INT =tracheal intubation, VAM = mechanical ventilation POp = postoperative pain* Facilitating the procedure, reducing time required for INT** Only in near term newborn

Level of Evidence (LOE): Very High ++++ (RCT), High +++ (RCT), Low ++ (Case series), Very Low + (Case report). Grade of Recommendation:strong or weak to use or strong or weak
high risk of cerebral damage. In literature there are extensive evidence that excessive volume, rather than pressure, is the key determinant of ventilator-induced lung injury (VILI). Inadequate (too small) VT also causes significant problems (atelectrauma); in particular inefficient gas exchange due to increased dead-space to VT ratio. Therefore in the last years volume-targeted ventilation has become an important standard of care in neonatal and pediatric respiratory support too.

There are many volume-targeted ventilation modes to be used in neonatal period, but Volume Guarantee (VG) ventilation, it is the most extensively studied volume-targeted ventilation mode in the neonate with respiratory distress syndrome. The Cochrane review on volume-targeted ventilation resulted in significant reductions in duration of ventilation, rates of pneumothorax, significant reduction in intraventricular haemorrhage (IVH) and a reduction in the incidence of BPD amongst surviving infants, of borderline statistical significance [3]. The VG ventilation plus adequate PEEP and an open lung strategy [4], seems to be an adequate alternative to High frequency Oscillatory Ventilation (HFOV) in mechanically ventilated infants for RDS.

References

A20
Issues of vaccination in premature infants: an overview
Paolo Manzoni1,2, Roberta Calzedda1, Elena Alitri1, Miguel Angel Pantoya Herrera1, Maria Fioretti1, Daniele Farina1
1SC Neonatologia e TINO, Ospedale Sant'Anna, AOU Città della Salute e della Scienza, Torino, Italy; 2Hospital Clinico San Borja Arriaran, Santiago, Chile
E-mail: paolomanzoni@hotmail.com

Premature infants (PI) are neonates born <37 weeks gestational age, with different PI subgroups being identified according to gestational age and birth weight. Prematurity is associated with increased morbidity and perinatal mortality, since yields increased risk for a number of pathological features and negative outcomes related mainly to the extent of all organs and functions’ immaturity. Among these conditions, neonatal and post-natal infections play a major role. PI feature increased odds of infections and infections-related morbidity throughout their first months of life. Among all preventative, anti-infective strategies, active vaccination is a key point for PI.

The most common vaccine-preventable diseases in PI are whooping cough, Haemophilus influenzae type-b (Hib) meningitis, invasive pneumococcal disease, rotavirus gastroenteritis, influenza. International guidelines recommend to deliver active immunization following the chronological timing (=counting the weeks of actual birth), and not following the corrected gestational age (=counting the weeks of life starting from the expected moment of birth). However, vaccinations in PI are often performed later than recommended, or even less than expected, as shown by recent studies carried out in Italy assessing significantly decreased rates of active immunization in PI.

This somewhat poor adherence to the international guidelines is related to concerns about weaker immune responses in PI, and possible adverse events. Nonetheless, several studies have shown that vaccines administered to PI have excellent safety profiles, fully comparable to term infants. Transient, benign episodes of apnea, with or without associated bradycardia, have been occasionally described in PI occurring up to 48 hours post-immunization. Though no significant morbidity nor long-term sequelae has been associated with these events, it is advisable to monitor these episodes for 48 hours after the completion of vaccination. Vaccines are immunogenic, generally safe and well tolerated in all infants including PI. Noteworthy, only vaccines specifically authorized for use in premature infants should be used in PI. The most immature neonates (i.e., ELBW infants) should receive their first dose of vaccine during hospitalization, in order to allow such risky groups of infants achieving sufficiently protective immunization before their discharge. This strategy also allows for adequate monitoring of cardiorespiratory function, and ultimately improves adhesion to the vaccination programs. Strategies aiming at promoting education and awareness about vaccination practices and recommendations in PI should be reinforced. The ultimate aim is to increase delivery of effective protection against vaccine-preventable diseases to these vulnerable patients since their discharge from the NICU.

Conflict of interest disclosure: All listed authors have no conflict of interest related to this article.

References

A21
Peripherally Inserted Central Catheter (PICC) placement in newborns, Italian training program for nurses: preliminary results
Memori Maria Rosaria1, Aversa Salvatore, Motta Mario, Romitti Maria Grazia, Ceri Marina, Prevendra Roberta, Titone Carmela, Cordella Alessandra, Marzollo Roberto, Pezzotti Elena, Dioni Elisabetta, Chicco Gaetano
Neonatal Intensive Care Unit Children Hospital, Civil Hospital of Brescia, Italy
E-mail: rosaria.memo@gmail.com

In the Italian Neonatal intensive care Units the positioning of Peripherally Inserted Central Catheters (PICCs) is strictly a medical competence, neonatal nurses are the ones fully entrusted of the PICCmanagement. In 2014 a group of neonotologists and nurses established at the Civil Hospital in Brescia a PICC group; the aim was to review and update the internal procedures but, also to ponder the idea of training nurses to place PICCs. Many were the reasons for this last consideration; to improve the quality and safety of neonatal critical care, to standardize the procedures to reduce errors and complications but also to make neonatal nurses fully aware of their role in PICCs correct management. A course was organized in two phases (lessons and practice) with the aim to provide participants with the knowledge and skills to safely position and manage PICCs. The careful work of review of national and international scientific literature regarding PICCs was carried out, the NICU procedures were updated prior the course onset [1-5]. For all the specific topics regarding PICCs were tackled during the first part of the course( theoretical). The second part (practical) was divided in three parts:A) “executor” nurses were supposed to successfully position 4 PICCs under medical supervision, B) “tutor” nurses were asked to correctly position 10 PICCs, C) maintenance of the acquired
skills. Data collection forms have been designed to keep records on PICCs placements, management and potential adverse events. Of the 54 nurses working in NICU, 32 (59%) participated actively at the project. At present 20 nurses have started the practical training: 6 have completed the A) phase. 53 PICCs have been successfully placed by nurses. The medium number of PICC placement for nurse has been 2.65. The training course for nurses has shown a good safety profile, a high success rate, and no post-procedural complications; a questionnaire has been proposed to all the NICU staff to acknowledge their opinions and impact. These preliminary data are promising, but we need to complete the whole program before being able to encourage other centers to follow our steps.

References

A22
Transport of the high-risk neonate
Hubert Messner*, Alex Staffler
Department of Neonatology, Central Teaching Hospital of Bolzano, Italy
E-mail: hubert.messner@asbz.it

Neonatal transport is continuously evolving and has developed to a cornerstone of modern perinatal medicine. Although the regionalization of perinatal care and delivery of high-risk neonates in appropriately designed centres improves neonatal outcome, neonatal transport represents an invaluable resource in order to guarantee tertiary level care throughout the region.

A highly trained, adequately skilled and well-equipped transport team is key in order to provide a good quality of care for a wide variety of clinical disorders and their potential complications. A safe and efficient neonatal transport begins in the referring hospital. An optimal communication between the referring team and the transport team is paramount. Besides collecting information the transport team may advise the referring team about specific steps to undertake until arrival [1]. Adequate resuscitation and effective stabilization improve survival and reduce the chances of deterioration during transport, especially in critically ill neonates with limited physiological reserves [2]. High risk conditions like pneumothorax, congenital diaphragmatic hernia, oesophageal atresia, cardiac malformations, abdominal wall and neural tube defects and hypoxic ischemic encephalopathy (HIE) are still life threatening and require highly specialized care and monitoring [3].

The equipment routinely used for monitoring in the neonatal intensive care unit (NICU) is not specifically designed for transport and may not function properly under transport conditions. However, standard monitoring including temperature, ECG, pulse oximetry and CO2-monitoring should be routinely provided [4].

Delivering adequate ventilatory support including the administration and measurement of INO may be challenging. A ventilator with an integrated flow sensor is helpful to assess respiratory function. The recommended ventilatory strategies in the NICU like volume-targeted ventilation can minimize lung damage and maintain more stable paCO2 values. There is a strong physiological rationale supporting the use of pre-heated and humidified air in ventilated infants, since it reduces trauma to the respiratory epithelium and is helpful to stabilize the body temperature [5,6].

Pharmacologic management including catecholamines, prostaglandins and analgesodivation via multilane insulinss may be necessary, thus rendering difficult situations still more complex. Active or passive body cooling in case of HIE is often demanding. Adequate protocols and an optimal temperature control to avoid accidental hyper- or hypothermia are essential [7]. In literature, data on high-risk transports are lacking, likely because of the difficulty to perform randomized studies in this field. Advanced training in resuscitation and stabilization of the neonate, as well as a specific transport and simulation based team training are mandatory for all personnel.

References

A23
Hospital management of severe bronchopulmonary dysplasia
Corrado Moretti*, Caterina S Barbàra, Rosanna Grossi, Stefano Luciani, Paola Papoff
Pediatric Emergency and Intensive Care, Department of Pediatrics, Policlinico “Umberto I”, Sapienza University of Rome, Rome, Italy
E-mail: corradomoretti@uniroma1.it

Despite early surfactant therapy, betterventilator strategies and greater use of noninvasive positive pressure ventilation, bronchopulmonary dysplasia (BPD) continues to be a complication of premature births.

The mainstay of supportive care for infants with severe BPD is mechanical ventilation with an endotracheal tube, however treatmentlast for a long time and have many complications. When safe extubation is not possible because of multiple failed attempts, tracheostomy is sometimes recommended [1-5]. In all age groups outside the neonatal period, placement of a tracheostomy is considered after a few weeks of mechanical ventilation [6,7]. By contrast, the optimum time and safety procedures have not yet been determined for the placement of a tracheostomy in infants with BPD who need protracted ventilation.

Reasons for not performing a tracheostomy in these patients include technical concerns associated with small patient size or the need for high ventilator settings. On the other hand the placement of a tracheostomy early in the course of severe BPD could have positive effects such as improved comfort, decreased need for sedation, lower systemic corticosteroid exposure, and enhanced nutrition and growth.

Recent data [8] suggest that a reasonable approach is that chronically ventilated infants should be assessed at 3 months of age, that is around or shortly after 40 weeks corrected gestational age. If the respiratory support remains high and has been so for 2 months with no evidence of improvement and after multiple attempts to wean the baby off positive pressure ventilation, then infants should be considered for a tracheostomy placement. Another important point highlighted by this report is that tracheostomies should be considered a safe procedure even in infants on high pressures and high concentrations of supplemental oxygen.

Other results [9] suggest a potential association between earlier (<120 days) tracheostomy and better neurodevelopmental outcomes. Actually, while an infant awaits a tracheostomy, the medical focus is often on strategies to allow weaning and limit ventilator-associated lung injury. Following a tracheostomy, the focus may shift to maximizing parent-child interaction and developmental improvement. Furthermore, after tracheostomy, there is often an opportunity to wean the baby off sedating medications, which are
frequently associated with increased risk of neurodevelopmental impairment.

In conclusion, tracheostomy does not mitigate the significant risk for adverse neurodevelopment that is associated with the many complications of prematurity; however, if tracheostomy is to be performed, earlier surgery may allow opportunities for enhanced neurodevelopmental outcomes.

References

A24 Neonatal renal venous and arterial thrombosis
Mario Motta
Neonatology and Neonatal Intensive Care Unit, Children’s Hospital of Brescia, Italy
E-mail: mario.motta@pedalicivile.bs.cia.it

Renal vein thrombosis (RVT) is one of the more common forms of neonatal thrombosis accounting for 15-20% of systemic thromboembolism [1,2]. A median age at presentation of 2-3 days have been reported [1,3], with unilateral and bilateral involvement of renal vein in 89-72% and 28-11% of cases, respectively [4,5]. The clinical presentation of RVT consists of increased kidney size, macro- or microhematuria, reduced urine output with some degree of renal failure and thrombocytopenia. RVT in neonates is a multifactorial disease and it was associated with coagulopathy, maternal diabetes, birth asphyxia, sepsis, placental insufficiency, and reduced or absent flow in renal vein [7]. Long-term functional complications include renal insufficiency, renal tubular dysfunction and hypertension in up to 30% of patients [1,8]. Controlled data on appropriate clinical management of neonatal RVT are lacking and recommendations of its treatment are based on low quality evidence. Current guidelines suggest for unilateral RVT in the absence of renal impairment or extension into the inferior vena cava, either 1) supportive care with radiologic monitoring for extension of thrombosis or 2) anticoagulation with unfractionated heparin (UFH)/low-molecular-weight heparin (LMWH) in therapeutic doses rather than no therapy [9]. For unilateral RVT that extends into the inferior vena cava, anticoagulation with UFH/LMWH or initial thrombolytic therapy with tissue plasminogen activator followed by anticoagulation with UFH/LMWH is suggested [9]. Renal artery thrombosis (RAT) in the neonate is far less common than RVT, and there is little information about its incidence. It is associated with umbilical catheters, patent ductus arteriosus and hereditary thrombophilia [10,11]. The clinical presentation is rather silent and renal ultrasound findings can be minimal unless Doppler imaging is used. The outcome of the affected kidneys is poor with common global atrophy. For neonates with a peripheral arterial catheter-related thrombosis, immediate removal of the catheter and UFH anticoagulation with or without thrombolyis or surgical thrombectomy and microvascular repair with subsequent heparin therapy are suggested [9].

References

A25 Which are the duties and the limits of nursing in neonatal ventilation?
Salvatore Muscolo
Pediatric nurse, Neonatology and neonatal intensive care, Fondazione Ca’ Granda, Ospedale Maggiore Policlinico IRCCS Milano, Italy
E-mail: sal.musc@libero.it

It’s difficult to talk about nurse’s autonomy in ventilation assistance, because it is a medical prescription. However in accordance with the Code of ethics, the professional profile and law 42/99, nurses have decision and operative autonomy in nursing care, which is achieved through specific autonomous and complementary interventions of intellectual, technical-scientific,
managerial, relational and educational nature [1-3]. The treatment of respiratory meets the need: help optimize gas exchange, reduce breathing exertion and promote healing process reducing hemodynamic interferences. These goals can be reached individualizing the treatment according to the pathophysiological features of the disease and the time evolution of single pathology. Monitoring peripheral oxygen saturation is more suitable method in the ventilated preterm (<27 weeks) because transcutaneous oxygenation monitoring is not of routine use for lack of an adequate correlation with the blood gas and for highly sensitive skin.

Many studies suggest the prevention of lung damage and retinopathy of prematurity concerning a prolonged hyperoxia by setting alarm limits in the event of administration of an oxygen concentration higher than 21%. Numerous clinical conditions, including the need for mechanical ventilation, can affect and change the brain oxygenation. The near-infrared ray spectrophotometry (NIRS) is a technique that allows non-invasive monitoring of oxygenation and cerebral hemodynamics. It provides a single quantitative parameter S02 (regional saturation of oxygen) as an index of tissue oxygenation [4].

Compared to the intubated newborn there is not a unique method and standardized anchorage of the endotracheal tube. The quality of the attachment can vary greatly depending on the choice of the tape and according to the method of tapering adopted.

No recommendation exists in the literature about the method of tapering: the most widely used systems include the use of one or two strips cut to Y or H. The adhesive tape, indisputably considered the system capable of guaranteeing the best results in terms of sealing, when applied with a tapering system and encoded together with a hydrocolloid protective largely reduces the risk of injury [5-8]. The aspiration of the airways in infants should be based on careful clinical assessment and not on a routine basis. It recommended to avoid suctioning the nose but use saline drops instead, then suction the oropharynx [9].

Care posture is crucial because it promotes the stabilization of the newborn functions and prevents bad posture [10]. It is recommended the use of ventilation systems with manual pressure control and delivered volumes in order to safeguard the delicate lung tissue. 

References

A26 New technologies applied to neonatal transport
Michele Panico
Neonatal Intensive Care Unit and Neonatal Emergency Transport, A.O.R.N. Sant'Anna e San Sebastiano, Caserta, Italy E-mail: michele.panico@libero.it

As neonatal care in the tertiary setting advances, neonatal transport teams are challenged with incorporating the innovations into their work environment. Some advancements over the last years involve communication, respiratory management, hypothermia, newborn comfort.

Communication: The communication gold standard is the implementation of advanced technologies an establishment of real-time teleservice clinical network that allows online collaboration between primary care physicians working in community hospitals and critical care transport teams on moving vehicles. These participants will be able to work in collaboration during the evaluation, stabilization and transfer of critically ill newborns.

Respiratory management: Many major respiratory treatments and the equipment required have been adapted for transport. There is evidence that new methods of non invasive ventilation support have significantly changed RDS management in preterm infants. Further perspectives for neonatal transport teams involve the assessment of NIV strategies. If the infant is less than 28 weeks, has an air leak, or has persistent pulmonary hypertension, the team may elect to place the infant on high frequency ventilation. To date two modes of HFV has been studied in the care of infants: high frequency oscillatory ventilation (HFOV) and high frequency jet ventilation (HFJV).

Monitoring peripheral oxygen saturation is more suitable method in the ventilated preterm (<27 weeks) because transcutaneous oxygenation monitoring is not of routine use for lack of an adequate correlation with the blood gas and for highly sensitive skin. Many studies suggest the prevention of lung damage and retinopathy of prematurity concerning a prolonged hyperoxia by setting alarm limits in the event of administration of an oxygen concentration higher than 21%. Numerous clinical conditions, including the need for mechanical ventilation, can affect and change the brain oxygenation. The near-infrared ray spectrophotometry (NIRS) is a technique that allows non-invasive monitoring of oxygenation and cerebral hemodynamics. It provides a single quantitative parameter S02 (regional saturation of oxygen) as an index of tissue oxygenation [4]. Compared to the intubated newborn there is not a unique method and standardized anchorage of the endotracheal tube. The quality of the attachment can vary greatly depending on the choice of the tape and according to the method of tapering adopted.

No recommendation exists in the literature about the method of tapering: the most widely used systems include the use of one or two strips cut to Y or H. The adhesive tape, indisputably considered the system capable of guaranteeing the best results in terms of sealing, when applied with a tapering system and encoded together with a hydrocolloid protective largely reduces the risk of injury [5-8]. The aspiration of the airways in infants should be based on careful clinical assessment and not on a routine basis. It recommended to avoid suctioning the nose but use saline drops instead, then suction the oropharynx [9]. Care posture is crucial because it promotes the stabilization of the neonatal functions and prevents bad posture [10]. It is recommended the use of ventilation systems with manual pressure control and delivered volumes in order to safeguard the delicate lung tissue.

References
The management of pain: non-pharmacologic analgesia

Patrizia Papacci, Francesca Serrao, Mikael Ghennet Tesfagabir, Velta Purcaro, Carmen Giannantonio, Costantino Romagnoli
Department of Pediatrics, Division of Neonatology, Catholic University of Sacred Heart, Rome 00168, Italy
E-mail: p.papacci@rm.unicatt.it


"Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Each individual learns the application of the word through experiences related to injury in early life" [1]. It is now clear that premature and full-term newborns have the neuroanatomical pathways from the periphery to cortex required for nociception. In fact by the 23rd week of gestation stimulation of pain stimuli is associated with physiologic, hormonal, and metabolic markers of the stress response. Indeed pain perception may be greater because of immaturity of descending inhibitory pathways [2]. Preterm infants are particularly vulnerable to brief and long term effects of pain and stress because system modulating sensory experience is immature [3,4]. Neonatal intensive care involves a high number of diagnostic and therapeutic procedures which are associated with pain for preterm and sick newborn infants. In addition to immediate unpleasantness, painful experiences can imprint themselves indelibly on the nervous system amplifying and causing typically painless sensations to be experienced as pain. Pharmacological and non-pharmacological intervention (NFI) are recommended for pain prevention and pain management [5]. In order to achieve optimum efficacy, both pharmacological and NFI additionally require a reduction of external stimuli, such as loud noise and bright light [6]. NFI is recommended for procedural and mild pain [7]. NFI for procedural pain is a treatment that is initiated before and during the procedure in order to reduce the physiological consequences of nociceptive transmission provoked by the procedure. Therefore NFI could be considered a "pre-emptive analgesia". NFI activate the "gate control mechanism", some intervention lead to an endogenous endorphin dispersal which contributes to modulation of the pain pulse at the level of spinal cord [8,9], some other may elicit activation of neuropeptides systems that can achieve an analgesic effect through the potentiation of opioid activity [10]. There is sufficient evidence to support the use of NFI, particularlybreast feeding, sweet-tasting solutions, kangaroo care, non nutritive suckling, swaddling and facilitate touching for the common needle-puncture procedures [11-13]. Other NFI such as music, olfactory and multisensory stimulation are to some degree beneficial to neonates who undergo painful procedures [14,15]. Despite our limited understanding of the underlying mechanisms of actions of NFI, there seems to be few documented short-term harms from their use. NFI need a collaborative effort. Support from the administration and leadership, both formal and cultural, is crucial for the implementation of NFI [16].

References

The best diagnostic approach for systemic neonatal infections

Roberto Pedicino1, Carmela Pacullo1, Manuela Bedetta1
1Department of Neonatology, Intensive Neonatal Therapy and Neonatal Pathology, University "La Sapienza di Roma-Policlinico Umberto I", Roma, 00100, Italy; 2Department of Intensive Neonatal Therapy, Policlinico Casilino, Roma 00100, Italy
E-mail: rpedicino@libero.it


Introduction: The difficulty to set up a diagnostic model to improve actual medical care results [1], depends on the varieties of clinical presentations for serious infections in the newborn and on his biophysical features. Additionally, many anamnestic risk factors [2] (choorioamnionitis, positive vagino-rectal coulture swabs for GBS) or care risk factors (invasive procedures) potentially involved in the occurrence of neonatal infections, represent furthermore confounding elements that restrain the possibility of readct shared diagnostic Guide Lines.

Discussion: Following diagnostic methods are available:
1. Clinical Examination of the patient: it still represents a fundamental diagnostic element: even without other data it often leads to the decision to start antibiotic therapy. Besides the classical clinical signs (fever, respiratory distress, etc.) according to some authors, the ECG monitoring of the heart rate could be very important [3,4].
2. Culture test: it is used to "verify" sepsis but for several reasons (contaminations, inadequate blood samples), it doesn't allow to rely exclusively on cultural results for a correct diagnosis: from 14% to 35% of emoculture [5] are negative even if there is a confirmed sepsis (with post-mortem tests or biopsies);
3. Blood cell count: including differential count, it has a low sensibility to contribute in a decisive way to diagnosis. However if leucocytes are less than 5000/mm3 diagnosis of serious infection become very suggestive.
4. Inflammatory Markers: many biomarkers tested in research gave a lot of aspectative no confirmed in the clinical practice. Anyway, C-Reactive Protein (to monitoring the effectiveness of therapy) and Procalcitonin (for fast increasing at the onset of sepsis) are the most used [6,7].
5. Molecular Tests: the PCR is an important technology. It can't replace the results of culture test. The main limits are represented by the cost and the impossibility to produce a susceptibility testing [5].
6. Genetics Tests: testing the genetic heritage [8-10] and the gene-expressions of patients (molecular and protein products) is the most recent field of research used to identify patients with a higher risk to develop infections. However, the limits and their true possibilities for clinical application are still unclear.

Conclusions: In the last 20 years, few results has been reached in reducing mortality due to neonatal infections despite the increased...
amount for general care and the effort expended on research. Actually, the best diagnostic approach seems still to rely on clinical examination, culture and hematological parameters (leukocytes count, neutrophils count, C-Reactive Protein and Procalcitonin). Promising prospects may be offered in the future from human genetic studies, for all the biological results (proteomics, metabolomics and transcriptomics) that they promise to reveal.

References

A29

The immune system in the control of microbiota homeostasis
Giuseppe Penna*, Maria Resigno
Department of Experimental Oncology, European Institute of Oncology, and Department of health sciences, Universita' di Milano, Via Addolorato 16, Milan, Italy
E-mail: giuseppe.penna@ieo.eu


Background: In the intestine, dendritic cells (DCs) are found in the lamina propria (LP) of the villi, in the mesenteric lymph nodes (MLN), lymphoid aggregates and Peyers' Patches (PP). Probably the most represented antigen presenting cells in the gut are those found in the LP as they definitely outnumber the number of DCs found in the MLN or PP. In the mouse, these mononuclear phagocytes can be divided into subgroups depending on the expression of CX3CR1 (the receptor of fractalkine) and CD103 (E integrin). CD103+ conventional DCs become tolerogenic in the gut, via their interaction with the local microenvironment and in particular with epithelial cells. Indeed, at steady state, ECs (Epithelial cells) condition anti-inflammatory DCs through the constitutive release of TSLP, TGF-b and retinoic acid (RA). EC-conditioned DCs even though phenotypically activated by bacteria polarize T cells towards a mucosal non-inflammatory T helper-2 phenotype or T regulatory cells. CX3CR1+ cells are instead apt at bacteria and food antigen uptake that they then transfer to CD103+ DCs via a gap junction-dependent mechanism. The interaction allows the establishment of tolerance to luminal antigens [1].

The microbiota can influence the cross-talk between immune cells and the mucosal microenvironment [2]. Thus the interplay between nutrition, microbiota and immune cells is decisive for the subsequent health of the infant. The rapid expansion of commercially available fermented food products raises important safety issues particularly when infant food is concerned. In many cases, the activity of the microorganisms used for fermentation as well as what will be the immunological outcome of fermented food intake is not known.

Materials and methods: We used established in vivo, in vitro and ex vivo models of infection/inflammation to study the immunomodulatory effects of fermented products of Lactobacillus paracasei CBA L74.

Results: We found in vitro and ex-vivo that fermented products of Lactobacillus paracasei CBA L74 act via the inhibition of proinflammatory cytokine release leaving anti-inflammatory cytokines either unaffected or even increased in response to Salmonella typhimurium. These activities are not dependent on the inactivated bacteria but to metabolic products released during the fermentation process. Indeed CBA L74 fermented products (both culture medium and fermented milk) could protect against colitis and against an enteric pathogen infection (Salmonella typhimurium). Hence we found that fermented products can act via the inhibition of immune cell inflammation and can protect the host from pathobionts and enteric pathogens [3].

Conclusions: These results open new perspectives in infant nutrition and suggest that L. paracasei CBA L74 fermented formula can provide immune benefits to an immature infant immune system.

References

A30

Adrenal insufficiency in the preterm infant
Simonetta Picone*, Roberto Aufieri, Piermichele Paolillo
Division of Neonatology and Neonatal Intensive Care, Casilino General Hospital, Roma, Italy
E-mail: simpico@libero.it


Cortisol production by the human fetal adrenal cortex has been shown to be not adequate at early gestation. This is due to an inefficient expression of 3β-hydroxysteroid dehydrogenase, the enzyme that catalyzes the synthesis of progesterone from pregnenolone, before about 23 weeks of gestation. Whereas, the fetal adrenal cortex it is able to produce dehydroepiandrosterone sulphate for placental estrogen synthesis and to convert placental progesterone to cortisol [1,2].

During the last trimester of pregnancy the fetal adrenal gland undergoes significant anatomical and functional maturation for adaptation to extra-uterine life and cortisol production increases greatly in the last two months of gestation. Cortisol increases synthesis of surfactant, enhances the reabsorption of lung fluid, promotes the conversion of T4 to T3, favors the closure of the ductus arteriosus and maturation of liver and intestinal enzymes [2].

Adrenal insufficiency can be caused by rare conditions such as adrenocortical hypoplasia or congenital enzymatic deficiencies of steroidogenesis, with clinical variables depending on the hormone involved.

In preterm infants, the developmental immaturity, combined with increased demands in critical illness, may result in insufficient cortisol production to maintain homeostasis in the face of acute stress or illness, despite apparently normal cortisol levels. This condition is known as “transient or relative adrenal insufficiency” (TAI) [3,4].

TAI usually appears in the first week of life and normalizes in the second week. Infants with TAI can exhibit refractory hypotension (hypotension not responsive to volume expanders and inotropic drugs, but responsive to corticosteroids), respiratory distress, patent ductus arteriosus and bronchopulmonary dysplasia (BPD) [2,3]. Diagnosis of TAI is not easy because many other conditions can cause hypotension in VLBW infants: hypovolemia, myocardial dysfunction, deficient vascular tone, hyaline membrane disease, infection or a combinations of these factors. In addition, normal basal cortisol levels are extremely variable in preterms and to date there is no consensus on the diagnosis of adrenal insufficiency based on tests with adrenocorticotropic hormone (ACTH) [5-8]. Appropriate dose and duration of
steroid therapy have not been established yet. On the other hand refractory and persistent hypotension is associated with intraventricular hemorrhage, periventricular leukomalacia, increased mortality and neurological disability [9]. Poor adrenal response has been shown to be associated with later development of BPO and with death [10,11]. For these reasons further studies are needed to evaluate the efficacy and safety of glucocorticoids in the treatment of cardiovascular failure due to TAI in I1 preterm and term infants [12,13].

References

A31 Germinal matrix hemorrhage-intraventricular hemorrhage: pathogenensis and outcomes
Ettoore Piro
DepartmentofSciencesforHealth Promotion andMother-ChildCare “G. D’Alessandro”, University of Palermo, Italy
E-mail: ettoore.piro@unipa.it

Germinal matrix hemorrhage-intraventricular hemorrhage (GMH-IHV) is one of the CNS injuries affecting preterm infants occurring in about 15%-20% of subjects weighing less than 1500 g. Currently, using ultrasonography, we recognize three grades of GMH-IHV. Grade I involving the subependymal parenchyma and/or extending in less than 10% of the ventricle, grade II with intraventricular bleeding not expanding in more than 50% of the ventricle, grade III characterized by consistent (> 50%)intraventricular bleeding with ventricular dilatation. A concomitant intraparenchymal lesion (IPL), due to a venous infarction (ex grade IV), can be associated with any grade of IVH, worsening the prognosis. Pathogenesis of GMH-IHV is multifactorial and complex, due to several factors identified as genetic predisposition, systemic (cardiorespiratory, hematologic, immunologic and metabolic) and developmental (immature anatomical substrates and immature, impaired cerebrovascular reactivity of the preterm brain) predisposing to intraventricular bleeding. Prenatal chorioamnionitis with umbilical vasculitis, primarily due to Ureaplasma species, is considered the main prenatal factor responsible for increased risk of GMH-IHV [1,3].

Of primary importance for the occurrence of intraventricular bleeding is considered the hemodynamic instability that, in the first three days of life, affects the extreme preterm, in which cerebral vasoreactivity and autoregulatory mechanisms to pressure variability are weak. In extremely preterm newborns, hypercapnia (paCo2 >55 mmHg), with consequent cerebral vasodilatation, arterial hypotension and persistent patent ductus arteriosus with diastolic steal, are responsible for the cerebral blood flow instability. Neonatal intubation, ventilatory strategies, intravenous fluid and electrolytes management and neonatal complications also play an important role.

In about 35% of infants with intraventricular bleeding a posthemorrhagic ventricular dilatation (PHVD) will occur, with possible evolution in about 22% in posthemorrhagic hydrocephalus (PHH), that in about 9% will require the placement of a permanent shunt, therefore complicating the outcomes [2]. Of primary importance is the treatment of symptomatic PHH. Communicating and non communicating hydrocephalus have different treatment options. Some preterm infants may be affected by a transient symptomatic form, and therefore need a short period of CSF diversion. In communicating hydrocephalus serial lumbar puncture, better if performed as “early intervention”, are associated with a reduced need of persistent shunt insertion. Ventriculoperitoneal shunt is the more frequent form of permanent CSF diversion used in PHH. Infections and shunt revisions are its main complications. In non communicating hydrocephalus endoscopic third ventriculostomy is an important alternative [3]. Survivors can be affected by neurological, neurosensorial, cognitive and behavioral impairment depending from the individual risk profile.

References

A32 Update on the cardio-vascular adaptation at birth
Graeme R Polglase1,2, Stuart B Hooper1,2
1The Ritchie Centre, Hudson Institute of Medical Research, Clayton Victoria 3168, Australia; 2Department of Obstetrics and Gynaecology, Monash University, Clayton Victoria 3168, Australia
E-mail: graeme.polglase@monash.edu

Background: Worldwide, millions of babies are born each day, and in many of these infants, the umbilical cord is severed and they must begin air-breathing to survive. These events dramatically change the infant’s system, transforming it from the fetal to the postnatal form, which then persists for the rest of its life [1,2]. However, if an infant is not breathing at birth, umbilical cord clamping will reduce venous return to the infant’s heart (preload) by ~50% and increase systemic vascular resistance (afterload); both of which decrease cardiac output [3]. Cardiac output will remain low until breathing commences, when it triggers the increase in pulmonary blood flow needed to restore preload for the heart [4]. We have recently discoveredthat commencing ventilation before the infant’s position, above or below the placenta, and uterine contractions induced by oxytocin administration, influences umbilical blood flow and the distribution of
blood between infant and placenta during delayed umbilical cord clamping (DCC) at birth.

Methods: All studies were approved by Monash University animal ethics committee. At 0.7 days gestation, preterm lambs were delivered and instrumented for measurement of umbilical, cardiovascular and cerebral pressures and flows. Blood volumes were measured beforehand after DCC using biotin-labeled red blood cells. Lambs were placed 10 cm above or 10 cm below the midline of the ewe and ventilation commenced. The umbilical cord was clamped 3 minutes after ventilation onset and lambs ventilation continued. In a separate group, oxytocin was administered to the ewe (i.v. 20 IU) during DCC.

Results: Gravity had no effect on cardiopulmonary haemodynamics. Placing lambs below the placenta reduced UA and UV flow compared lambs placed above the placenta, resulting in increased pulmonary blood flow. No significant difference in blood volume was detected. There was no difference in systemic or cerebral oxygen kinetics during the transition at birth. Oxytocin administration during DCC has significant effects on umbilical blood flow and causes decreased arterial and cerebral oxygenation.

Conclusion: Management of the mother and baby during DCC can influence oxygenation and the cardiovascular transition at preterm birth.

References

A33 Nutrition and immunity in newborns
Antonietta Giannattasio, Valentina Marra, Stefania Zoccali, Letizia Capasso, Francesco Raimondi
Department of Translational Medical Sciences-Section of Neonatology, University of Naples Federico II, Naples Italy
E-mail: raimondi@unina.it

Through fetal life, infancy and childhood, the immune system undergoes a process of functional maturation. The adequacy of this process is dependent on environmental factors, and there is strong evidence of the impact of pre- and post-natal nutrition in this regard [1]. The early postnatal period is a critical window for immune maturation of newborns. Exclusive human milk feeding for the first 6 months of life is recognized as the normative standard for infant feeding [2,3]. Human milk contains many hundreds to thousands of distinct bioactive molecules that protect against infection and inflammation as cytokines, nucleotides, hormones, and growth factors [2,3]. These specific protective components are so numerous, that science is just beginning to understand their functions. One of these is osteopontin. Human colostrom is very rich in osteopontin and mature human milk contains fold more osteopontin than cow’s milk. Recent studies suggest that human milk osteopontin might regulate inducible nitric oxide synthase and synthesis of nitric oxide, improve barrier function and reduce inflammation. Thereby mediating cell attachment, migration, chemotaxis and intracellular signaling, osteopontinhas important barrier functions, protecting the intestinalmucosa against drug-induced colitis in murine models, increasing the levels ofTGF-beta1 and decreasing pro-inflammatory cytokines [4].

Nutrition is a key component also for the composition of intestinal microbiota [5]. Several studies have provided conclusive evidence of the critical role of the intestinal microbiota in regulating both mucosal and systemic immunity [5]. Immediately after delivery, the human infant acquires a much complex microbiota. It is known that intestinal microbiome composition and diversity are affected by several factors as maternal clinical conditions, route of delivery, antibiotic administration and infant diet (breast- versus formula-fed infants). In breast-fed babies, Bifidobacteria and Lactobacilli quickly become dominant, whereas in formula-fed babies, Bacteroides species are prevalent, alongside other bacteria known to be enteric pathogens. Furthermore, breast milk contains high concentrations of oligosaccharides, which ferment in the bowel and promote the growth of Bifidobacterium gut commensals. Dysbiosis in early life has been associated with immune-mediated childhood disorders and obesity [5].

In the long-term, nutritional strategies might improve the development of the microbiome and intestine with the final aim to enhance the clinical care of high-risk infants as low birth weight and premature infants. However, nutritional research to date suggests that there will not be a simple or single nutritional intervention but multiple actions are needed to reverse the association between malnutrition and infection.

Background: Preterm infants have a high risk to develop visual deficits due to retinopathy of prematurity (ROP), brain lesions and prematurity per se [1]. The possibility to assess different aspects of visual function can allow early and specific intervention in an attempt to reduce the risk of difficulties in motor coordination, attention and learning at school age. The aim is to identify early signs of visual and motor-perceptual deficit in the first years in order to program a specific intervention before school age.

Methods: Very preterm infants born at Gestational Age (GA) 23 weeks, with and without brain lesions and ROP ≤ stage 2, were assessed at 35 and 40 weeks post-menstrual age using a visual assessment specifically designed for neonates; a structured follow up assessment, including fixing, tracking, visual acuity, visual fields and visual attention (using the Fixation Shift test) was used at 3, 5 and 12 months corrected age. Tractography of the optical radiation was performed in some consecutive infants in the neonatal period. Results at all the tests were compared with normative data on term born infants.

Results: Ocular movements and tracking were more complete in preterm infants at 35 weeks than in full term infants, whereas reaction to a colored target, discrimination of stripes and attention at distance were more mature at term age both in preterm and term born infants. Tractography of the optical radiation showed that at term equivalent age visual assessment was significantly correlated with fractional anisotropy values (P<0.001)At 3, 5 and 12 months preterm infants showed similar results to term born infants in all visual aspects but visual attention, with a high percentage of infants failing or refusing the test. Irrespective from the MRI findings, preterm infants with a normal neonatal assessment showed normal visual competences at 12 months corrected age.

Conclusions: A structured visual assessment can be reliable and useful in the neonatal age [2]. Some visual aspects are influenced by extrater
inexperience, others depend on cortical maturation [3] as proved by the level of development of the white matter in the optical radiation [4]. The neonatal assessment has a good correlation with visual development at one year [5]. In low-risk preterms visual attention appears to be already impaired in the first year from birth [6].

References

References

A36

Recurrent respiratory infections in the follow-up of the extremely low birth weight infant

Oliviero Sacco, Michela Silvestri, Giovanni A Rossa

Department of Pediatrics, Pulmonary Unit, Istituto Giannina Gaslini, Genoa, Italy

E-mail: giovannirosso@ospedale-gaslini.ge.it


Most of the extremely low birth weight (ELBW) infants, those with a birth weight <1,000 g, are also the youngest of premature newborns, usually with a <27 weeks’ gestational age (wGA). ELBW survival has improved with advancement of neonatal technologies, but survivors may face early and life-long morbidities that include infectious respiratory disorders [1]. This increased predisposition is related to a variety of immunological, structural and iatrogenic factors. At the time of term birth, the innate immune response has not fully matured and the adaptive immune system must still develop specificity and memory, completed only in the early childhood [2]. The immaturity of the innate immune systems more pronounced in preterm infants. The classical, alternative and lectin complement pathways are all reduced in their pathogen-killing abilities and the production and release of soluble antimicrobial proteins and peptidolysin leukocytes are deficient. Preterm infants have reduced pool of neutrophils and monocytes and their precursors, compared to term-neonates, and have deficient T cell function with greater proportion of naive T cells and a low subpopulation of memory T cells. A reduction in lymphocyte subpopulations is still detectable at 8 years of age. There is also a limited production of immunoglobulin (Ig) by the fetus and antigen-specific IgG is transferred across the placenta from the maternal circulation in large amounts after 32 wGA. The lung structures are also structurally and functionally immature in the ELBW. An early complication of extreme prematurity is respiratory distress syndrome caused by surfactant deficiency, with collapse of the alveolar structures, atelectasis edema and decreased lung capacity. Supplemental oxygen and ventilatory support may lead to complications, such as air leak syndrome and chronic lung disease of prematurity and increase the risk of persistent damage to the fragile, immature pulmonary structures [3]. Infections are a major contribution to the morbidity and mortality of ELBW infants at any time of the clinical course [4]. The incidence of early-onset infections, due to bacteria from the maternal genital tract but also to nosocomial environmental bacteria and fungi and to airborne viruses, increases in the U.S.A. from <1/1000 live births to 8/1000 in ELBW births. ELBW infants are also at high risk of vaccine-preventable diseases, such as pertussis and Haemophilus influenzae and Corynebacterium diphtheriae infections: according to the international recommendations, they should receive full doses of the conjugate vaccines at the appropriate chronologic age [5].

References
Chronic lung disease after premature birth.
Improved cognitive Changes in the long
Effect of different doses of vitamin D on osteocalcin
sequences [4]. The ethiology is
there are many questions about the
110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

nsequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.

sequences [4]. The ethiology is

110
2007, et al

121(6)
Human intrauterine growth and nutrient accretion.


**A39**

A "child-friendly" hospital: a difficult definition

Gian Paolo Salvetti
Professor Emeritus of Paediatrics, Alma Mater Studiorum – University of Bologna, 40126 Bologna (BO), Italy


It would be quite interesting and instructive to sketch the history of how children’s hospitals came to be established. Our first thought goes to the "Ospedale degli Innocenti" in Florence and the establishment of orphanages, which for many years were the only available facilities, but which took in only orphans and children abandoned by their parents. Until paediatrics became an independent branch, also in terms of teaching at the university level with the creation of the first chair in Rome, in the early 1900s, held by Professor Concetti, the beds for hospitalized children were in the Internal Medicine and the General Surgery Wards. Following the example of the first paediatric clinics established in the late 1800s in France, in Paris, the first children’s hospitals were founded also in Italy, in Rome, Palermo, Bologna, Naples, Genoa and gradually in other cities, thanks to bequests from wealthy members of the aristocracy and public and private benefactors.

The technological progress and the development of welfare assistance in the 1960/70s, the scientific commitment of paediatricians and the affirmation of their role in the care of children in the development stage led to the gradual spread of paediatric and neonatology wards in our country. However, significant differences continue to exist between regions even today and, furthermore, the economic crisis that has been affecting the country for years now is leading to a downgrading of paediatric and neonatology wards, where head physician positions are not filled again upon vacancy and which are merged with adult care wards.

It would be preferable to cut and downsize the positions of the administrative staff rather than those of the doctors and nursing staff. Another critical issue remains in terms of the improper hospitalization of children and adolescents in general medicine or specialized (otolaryngology, ophthalmology, dermatology, orthopaedics, etc.) wards for adults.

A "child-friendly" hospital must of course offer surroundings suited to the age of the young patients, from birth to adolescence, such as areas for mothers who are nursing or who have to assist their hospitalized child, a games room, a schoolroom, but above all the facility must allow and ensure the “care” of these young patients, involving their parents and allowing them to remain close to their children.

Moreover, doctors must be freed from the continuous and unrelenting administrative procedures thrust upon them (meetings on budgets, on the various audits, etc.) and given more time to devote to one of the most sensitive aspects of our work: communication with patients and their families. Ultimately, we are simply re-inventing the wheel; already the ancient Romans reaffirmed the principle that all those involved in childcare should observe: “Maxima debetur puerre reverentia”.

**A40**

Comfort care: the life has always a dignity even if it is very short and its beginning is confused with the end

Franca Saracino1, Immacolata Como1, Asia Piccolo2, Annalisa Agangi2, Antonio Maria Salzano3, Francesco Messina3, Paolo Puggina4

1Department of Neonatology and Neonatal Intensive Care Unit, “Villa Betania” Evangelical Hospital, Naples 80147, Italy; 2Department of Obstetrics and Gynaecology, “Villa Betania” Evangelical Hospital, Naples 80147, Italy; 3Service of Clinical Psychology, “Villa Betania” Evangelical Hospital, Naples 80147, Italy

E-mail: francasaracino@tiscali.it


The comfort-care is an innovative practice introduced recently by the neonatologist Dr. Elvira Parravicini, from Columbia University Medical Center [1]. This practice in a Neonatal Intensive Care Unit (NICU) is a compassionate response that provides families with clear and relevant information and that focuses on the needs of the parents as well as the baby. On the baby side, the need to be kept warm, to be free from hunger, thirst or pain are the cornerstones of the program. On the family side, it is a viable option of care for fetus/neonates who are suffering from life-limiting conditions which takes into account the emotional needs of the family at this difficult time [2]. When we are not able to ensure medical treatments aimed at curing the disease, we can help in a different way. Palliative care planning involves multidisciplinary team planning with professionals from (1) gynecologist (2) midwife, (3) neonatologist, (4) pediatric nurse, (5) psychologist. The multidisciplinary approach is pointed on the satisfaction of “essential needs” of both the family and the baby starting from the pre birth care to the post death care. The team’s goals cover practical aspects of infant care, including pain relief, symptom relief, comfort and dignity, the management of prognostic uncertainties, but also the provision of support to families during the pregnancy, their baby’s illness and afterwards when coming to terms with his loss. The target population is all infants with a life-limiting conditions (trisomy 13, trisomy 18, bilateral renal agenesis or anencephaly, etc.) for whom a decision has been made to not interrupt the pregnancy [1]. The care planning is very flexible and continuously considers parents’ personal and/or spiritual wishes, moreover it is continuously reviewed in the best interests of the baby. Multidisciplinary discussions and decision making involving the parents and the team to plan the management are essential. At least also the staff is provided with informal and formal support during the period of providing palliative care [3,4].

**References**


**A41**

From tin at home: the other side of the coin of the breastfeeding

Chiara Selmi
USL 4, Prato, 59100, Italy

E-mail: selmicsi52@gmail.com


The promotion of breastfeeding and the monitoring of the prevalence of breastfeeding at discharge of the newborn is one of the priorities of the health plan’s integrated ToscanaRegion [1]. Since 2004, it implemented various measures to promote breastfeeding and has been involved in various investigations: “Birth Path” on a sample of 1,657 women who had
given birth year previous [2], “Being a mother informed” on 2,324 pregnant women in birth centers Toscani, your raving two to three months after the childbirth [3]; and finally a survey conducted in 2010 in which 5,885 questionnaires were administered to parents who accompanied the children to make the first or second dose of vaccine required, in 44 vaccination centers AUSL, championships in the region. Since 2008 data on the prevalence of breastfeeding are found on the Certificate of Assistance at Childbirth (Cedap) compiled before discharge. This will get annual data on the entire population. Comparing data obtained in the investigation there was an increase of exclusive breastfeeding at discharge 66% in 2001 to 76% in 2010. The increase was confirmed in 2012 by Cedap service where it should be noted, a proportion of exclusive breastfeeding by 85 % with higher percentages to 80 % in the Baby-friendly Hospital of Tuscany. The practice of breastfeeding exclusively decreases greatly from the earliest months of life. In fact, in the survey of 2010, children breastfed exclusively were 57.5%, 17.8% is nursed in a complementary and 24.7% were not breastfed. It would seem that mothers have the perception of having “less milk” or feel disoriented by the sudden increase in demand from nurse, often it is the so-called “crisis of the third month” when the child begins to show more interest to the environment exterior that is highly stimulating; or a “growth spurt” due to the increased demand of the growing child and needs to encourage more breast attaching more often. His most distractibility breast is interpreted by the mother as a reluctance to suckle the breast and this affects the maternal perception of not having enough milk.

References

A42
Genetic factors predisposing to bronchopulmonary dysplasia. A pilot study by exome sequencing and pathways analysis
Marco Somaschini1, Chiara Di Resta1, Chiara Volontè1, Emanuela Castiglioni1, Silvia Bongiolo1, Dejan Lazarevic5, Davide Cittaro4, Elia Stupka5, Maurizio Ferrari1,2,3, Paola Carrera1,2.
1. Unit of Genomics for Diagnosis of Human Pathologies, Division of Genetics and Cell Biology, IRCCS Ospedale San Raffaele, Milano, Italy; 2. Laboratory of Clinical Molecular Biology, IRCCS Ospedale San Raffaele, Milano, Italy; 3. Vita-Salute San Raffaele University, Milano, Italy; 4. Centre for Translational Genomics and Bioinformatics, IRCCS Ospedale San Raffaele, Milano, Italy; 5. Unit of Neonatology, Clinica Sant’Anna, Lugano-Sorengo 6924, Switzerland

Background: Bronchopulmonary Dysplasia (BPD) is a multifactorial disease with a significant genetic component. Twin studies indicate that heritability of BPD is estimated at 53 to 79% [1]. Association studies have identified several potential candidate genes encoding components of innate immune and antioxidant defenses, mechanisms of vascular and lung remodeling, matrix remodeling proteins, surfactant proteins [2,3]. We planned a prospective multicentre study aimed to identify rare genetic variants contributing to the BPD phenotype by exome sequencing using next-generation sequencing (NGS) technology.

Materials and methods: 26 unrelated newborns with a clinical diagnosis of severe BPD according to NIH Consensus Criteria [4] were selected among a collected cohort of 366 premature neonates of European origin with gestational age ≤ 32 week and born in 12 Italian centers. Genomic DNA was extracted from peripheral blood and exome sequencing was carried out on an Illumina HiSeq2000 platform. In order to identify potentially interesting variants related to BPD pathogenesis, we adopted two different strategies: 1) Candidate genes previously associated with BPD in association studies 2) Prioritization analysis based on pathways potentially involved in the pathogenesis of BPD (TopGene Prioritization tool).

Results: 1) Candidate genes: we identified a total of 61 variants in 19 candidate genes previously associated with BPD and confirmed them with Sanger; 31 are common polymorphism, 25 are rare and classified as dbSNPs with a MAF <0.05 and 6 are novel. Considering all the variants, the most mutated genes are those belonging to the TLR-family (TLR10, TLR1, TLR4), to oxidative stress-related genes (EPHX2, MTHFR, EPHX1) and to surfactant metabolism genes (SFTPD, ABCA3). 2) Prioritization analysis: we decided to focus first on the list of the top 5 genes: TLR1, MMP1, NOS2, CRP and LBP. To evaluate the possible interaction between candidate genes previously associated with BPD and showing variants in our sample (ABC2, SFTPD, SPOC2, ACE, MTHFR, EPHX2, EPHX1, EPHX2, TLR5, TLR10, TLR1, TLR6, TLR4, GSTP1, MBL2, TLR10) and the top 5 genes (NOS2, TRL1, MMP1, CRP, LBP) highlighted with prioritization analysis we usedString 9.122. The results allow the possibility of a networking with a main focus on genes involved in inflammation (figure 1) [5].

Conclusions: In consideration of the results obtained in this pilot study, we can conclude that the approach may be interesting to initiate the dissection of genetic pathogenesis of BPD. Our study indicates that genes regarding inflammatory response and tissue remodeling may be relevant in BPD pathogenesis. These preliminary results need to be confirmed and may contribute in improving knowledge of pathogenesis of BPD and targeting therapeutic interventions.

Acknowledgement: We would like to thank the association “Un RespironeFuturoOnlus”.

References
3. Shaw GM, OBrodovich HM. Progress in understanding the genetics of bronchopulmonary dysplasia. Semin Perinatol 2013, 37:45-93.

A43
Old and new strategies for the prevention of nosocomial infections
Ilaria Stolfi1, Carla Fassi1, Roberto Pedicino2, Luigi Giannini3
1. Department of Obstetrics and Gynecology, Newborn Emergency Transport Service (STEN), Umberto I Policlinico of Rome, University hospital, Sapienza University of Rome, 00161, Italy; 2. Department of Obstetrics and Gynecology, Neonatal Intensive Care Unit, Umberto I Policlinico of Rome, University hospital, Sapienza University of Rome, 00161, Italy; 3. Department of Obstetrics and Gynecology, University of Rome, 00161, Italy.
Nosocomial infections are a significant issue of public health. In Italy, the incidence of nosocomial infections range between 5 and 8% [1]; in Neonatal Intensive Care Unit (NICU) range between 7 and 24.5% [2]. Nosocomial infection in a newborn is defined as an infection arising after 48-72 hours of hospitalization. The extremely low birth weight (ELBW) neonates have an increased risk of developing infections (40%) [2], due to the immaturity of the immune system, the prolonged length of hospitalization and the frequent need for invasive procedures (central venous catheters - CVC, mechanical ventilation, parenteral nutrition, prolonged antibiotic therapies). In NICU, sepsis accounted for 45-55% of cases of nosocomial infections, followed by the lower respiratory tract infections (16-33%), skin and soft tissue infections (26.3%), urinary tract infections (8-19%) and meningitis (9.6%) [2]. The gram-positive bacteria are responsible for 65% of infections (Coagulase-negative Staphylococci – CoNS, Staphylococcus aureus and Enterococcus spp respectively in 50, 35 and 6% of cases), followed by Gram-negative bacteria (Klebsiella, Pseudomonas aeruginosa) in 25% of the infections [2]. Candida albicans is involved in 50% of cases of fungal infections. Viruses are accountable for epidemics in the NICU, but the incidence of viral infections is likely to be underestimated.

The prevention of nosocomial infections is an essential element for the management of the newborns [3,4] and is based on strategies to reduce the risk factors related to the newborn (immune system, carefull skin care, etc.) and to improve the invasive care procedures (implementation and dissemination of guide lines for accurate and proper hand hygiene [4,5], for prevention of CVC related infections [4,6] and ventilator-associated pneumonia [7], promotion of enteral feeding with breast milk [8]). Not least, the need for accurate diagnostic strategies for early detection of neonatal infections and a rational use of antimicrobial therapies and antibiotic prophylaxis [9,10]. The new strategies of prophylaxis of infections involving the use of bioactive substances with anti-infective properties, such as lactoferrin [11]; the use of probiotics, which have recognized immunomodulatory and anti-infectious activities [12]; the prophylaxis with antifungal drugs [13]. Lastly, NICU should also meet specific criteria of organization, providing to maintain an adequate ratio nurses/beds, avoid overcrowding and understaffing, make easily available devices for hand washing, organize meetings for training/provide to caregivers regular feedback of performance data, plan continuous monitoring and a surveillance system of the rate of nosocomial infections and avoid preventive measures of unproven effectiveness.

References

A4A

Delivery room management of extremely low birth weight infants in Italian level III hospitals

Daniele Trevisanuto1, Irene Satarianno1, Nicoletta Doglioni1, Giulio Criscilli2, Francesco Cavallini3, Camilla Giza4, Claudio Martano5, Fabrizio Cirilli6, Flaminia Torelli7, Paolo Ernesto Villani8, Sandra Di Fabio9, Lorenzo Quattrelli10, Luigi Giannini11.

1Children and Women’s Health Department, Medical School University of Padua, Azienda Ospedaliera Padova, 35128 Padua, Italy; 2Italian Army - Signals and Information Technology HQ - C4 Systems Integration Development, Treviso, Italy; 3Independent Statistician, Padua, Italy; 4Neonatal Care Unit Pediatric and Neonatal Department, “S. Giovanni Calibita” Fatebenefratelli Hospital - Isola Tiberna 00186 Rome, Italy; 5Neonatal Intensive Care Unit Pediatric Department, Medical School University of Turin, Azienda Ospedaliera OIRM-S. Anna 10126 Torino, Italy; 6Neonatal Intensive Care Unit Department of Mother and Infant Science, Fondazione IRCCS Ca’ Granda Ospedale Maggiore Policlinico, University of Milan 20122 Milan, Italy; 7Neonatology Unit, University of Genova, Azienda Ospedaliera San Martino IRCCS – IST National Institute on Cancer Research 16100 Genova, Italy; 8Neonatal Intensive Care Unit, Maternal and Pediatric Department, Carlo Poma Hospital, Mantova, Italy; 9Neonatal Intensive Care Unit, Department of Mother and Infant Science, “San Salvatore” Hospital, L’Aquila, Italy; 10Neonatology Unit, “A. Perrino” Hospital–ASL 2100 Brindisi, Italy; 11Pediatric Department Medical School University “La Sapienza” Rome, Azienda Ospedaliera Policlinico Umberto I, 00161 Rome, Italy.

E-mail: trevo@pediatria.unipd.it

Italian Journal of Pediatrics 2015, 41(Suppl 1):A4A

Background: 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.

We aimed evaluate the consistency of practice and the adherence to the International Guidelines in early delivery room management of ELBW infants in Italy.

Materials and methods: A questionnaire was sent to the directors of all Italian level III centers between April and August 2012.

Results: There was a 92% (n=98/107) response rate. Participating centers reported an overall number of 198.322 births during 2011, and of these, 193 were ELBW infants. Northern and Central centers had a higher median of births and of ELBW infants than Southern centers.

A provider skilled in neonatal resuscitation is present in high-risk deliveries in 46% of III level centers: this rate was higher in Northern (77.5%) than in Central (33.3%) and Southern (21.6%) centers. The team leader for neonatal resuscitation is generally a Pediatrician/Neonatologist (67.2%). The median delivery room temperature was 24°C (IQR: 22–25). Only 18 centers (20.2%) achieved a delivery room temperature over 25°C.

A polyethylene bag/strap was used by 54 centers (55.1%). Most centers had a pulse oximeter (91/98, 92.9%) available in delivery room and used saturation targets (82/98, 83.7%). In Northern regions, one centre (2.5%) said it used 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%). 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%). A median of 13% (IQR: 5%–30%) of ELBW infants received chest compressions at birth in Italy.

Conclusions: Overall, our results show a good adherence to the International Guidelines for Neonatal Resuscitation. Nevertheless, we
found some relevant differences among the surveyed centers. Interventions to interpret and reduce the discrepancy among the different geographical areas are needed.

References


A45 Antibiotics and multi-resistant organisms

Chryssoula Tzialla, Elisa Civardi, Margherita Pozzi, Mauro Stornati Neonatal Intensive Care Unit, Fondazione IRCCS Policlinico San Matteo, Pavia, Italy
E-mail: c.tzialla@smatteo.pv.it

The development of antibiotic resistance is a normal evolutionary process for microorganisms, but it is accelerated by the selective pressure exerted by the widespread use of antibiotic drugs. Nearly all very low birth weight infants admitted to neonatal intensive care units (NICUs) receive an empirical antibiotic treatment in the first days of life, despite the evidence of sterile cultures [1,2]. Several studies show that widespread and inappropriate use of antibiotics is very common in NICUs and that the overuse of antibiotics like third-generation cephalosporins favors the emergence of multi-resistant (MR) bacteria in NICUs [1,2]. A recent study describes 1,106 episodes of bacteremia in NICUs: 35.5% were caused by Gram-negative bacteria (GNB), and 18.6% by MR strains. In the multivariate analysis the authors identified as independent risk factors the presence of resistance in the exposure to third-generation cephalosporins, and carbapenems [3]. Glycopeptide antibiotics remain adequate as treatment of most staphylococcal infections and vancomycin is the drug of choice for serious infections [1,4]. However, in cases of infections due to Gram-positive bacteria (GPB) unresponsive to vancomycin, linezolid has been the most used in neonatal settings. Several novel antibiotics active against GPB are currently in diverse phases of development [1,4]. GNB are often resistant to at least one class of antibiotics that is used as standard, and may be from time to time resistant to all first-line antibiotics. The development of new antibiotics active against resistant GNB has not progressed in parallel with increasing rates of resistance. This scenario of limited therapeutic options has prompted renewed interest in older and more toxic antimicrobials [4,5]. Since antibiotic resistance cannot be eradicated, different strategies have been proposed to slow the development and spread of MR that aim to [6,7]: 1) improve the knowledge of MR bacteria and antibiotic use through surveillance at national and international levels; 2) conserve the effectiveness of existing treatments and 3) stimulate the development of new antibiotics, alternative treatments and preventive strategies. Antibiotic resistance is a public health concern worldwide. Although some important molecules are currently in diverse phases of development for treatment of infections due to resistant GPB, very few drugs have been reached advanced stages of development for infection due to MR gram-negative bacilli. At this point it is essential to preserve the efficacy of existing drugs while efforts to develop new treatment options proceed.

References


A46 Specific formulas for preterm infants, how and when

Antonio Alberto Zuoppa, Piero Catenaazi, Riccardo Riccardi, Costantino Romagnoli
Department of Pediatrics, Division of Neonatology, Catholic University of the Sacred Heart, Rome, Italy
E-mail: zuppaaa@rm.unicatt.it

Both ESPGHAN (2010) and AAP (2012), stated that “all preterm infants should receive human milk” for the many short-term and long-term benefits [1,2].

Table 1 (abstract A46) Recommended intakes for macro and micronutrients [1-4]

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Per 100 kcal</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy, Kcal</td>
<td>-</td>
<td>A reasonable range of energy intake for healthy growing preterm infants with adequate protein intake is 110 to 135 kcal/kg* day.</td>
</tr>
<tr>
<td>Protein, g (VLBW)</td>
<td>3.3 - 3.6</td>
<td>Protein supply needs to compensate for the accumulated protein deficit observed in almost all preterm infants. The quality of the provided protein may interfere with the recommended intake because the infant does not require proteins but requires specific amino acids. Whey predominant protein with reduced glycomacropeptide and α-lactalbumin enrichment could be used to optimize the amino acid profile</td>
</tr>
<tr>
<td>Protein, g (ELBW)</td>
<td>3.6 - 4.1</td>
<td></td>
</tr>
<tr>
<td>Carbohydrates, g</td>
<td>10.5 - 12</td>
<td>According to the relatively reduced intestinal lactase activity, the lactose content could be relatively reduced and replaced by glucose polymers with the characteristic of maintaining the low osmolality of the formulas</td>
</tr>
<tr>
<td>Lipids, g</td>
<td>4.4 - 6</td>
<td>In order to improve fat absorption, an important quota of fat could be given as medium-chain triglycerides with a maximum of 30-40% of lipid content</td>
</tr>
<tr>
<td>Calcium, mg</td>
<td>110 - 130</td>
<td>The calcium to phosphorus ratio (1.5 – 2) may be an important determinant of calcium absorption and retention</td>
</tr>
<tr>
<td>Phosphate, mg</td>
<td>55 - 80</td>
<td>Iron is essential for brain development, and prevention of iron deficiency is important. Prophylactic enteral iron supplementation (given as a separate iron supplement) should be started at 2 to 6 weeks of age (2-4 weeks in extremely-low-birth-weight infants) and should be continued after discharge, at least up to 12 months of age depending on diet</td>
</tr>
<tr>
<td>Iron</td>
<td>1.7 - 2.7</td>
<td></td>
</tr>
</tbody>
</table>
All kinds of breast milk (fresh by own mother or pasteurized by donor) for preterm should be fortified, to gain the required recommendations. In case of its absence the only alternative is represented by the formulas for preterm infants (PTF).

It is not yet definitively established the ideal PTF composition, particularly for ELBW infants. Table 1 shows the main recommendations for nutrients [1-4].

A study compared the use of a soy-based formula (with calcium, phosphorus and vitamin D), with a PTF. Infants taking soy showed lower growth, levels of protein and albumin [5]. ESPGHAN in 2006 concluded that soy-based formulas should not be used in premature infants [6].

The use of hydrolyzed formulas has not shown a preventive role on cow’s milk protein allergy, it has proven helpful in improving food tolerance (acceleration of the intestinal transit time and faster achievement of full enteral feeding), but it has a reduced nutritional value, (especially protein intake) [7-11].

A recent study evaluated the usefulness of a thickened formula in reducing apnea of prematurity GERD-related. The authors conclude that these formulas are not effective in the reduced number of apneas GERD-related [12].

In recent reviews post-discharge formulas does not seem to provide benefits, especially for the heterogeneity of the studies [3,13]. They may be useful for infants with GA <33 weeks, particularly those <30 weeks, with growth at discharge below the 10th percentile (the ESPGHAN recommended their use up to 40 weeks, and for a further 12 weeks if necessary) [3].

Studies about GOS and FOS showed an increase of bifidobacteria in the stool, a reduction in their viscosity and an acceleration of intestinal transit time, resulting in an easier achievement of full enteral feeding [14,15]. It is also assumed a role in the prevention of NEC and LOS. Even though they have proven their beneficial role, further studies are needed to establish the type and dose [16].

Several RCTs and recent reviews have shown a benefit of prebiotics in reducing NEC and the achievement of full enteral feeding [17-19]. Further studies are needed to establish dose, strains and routes of administration [1].

Lactoferrin, both human and bovine, seems to have a significant role as a protective agent against NEC and LOS [20-23].

The available data do not allow to recommend formula supplementation with these substances with functional properties.

References


Cite abstracts in this supplement using the relevant abstract number, e.g., Zuppa et al.: Specific formulas for preterm infants, how and when.