

Ocho principios para el cuidado centrado en el paciente y la familia para recién nacidos en la unidad de cuidados intensivos neonatales.

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Resumen

A pesar de las recientes mejoras en el cuidado médico perinatal que han llevado a un aumento de las tasas de supervivencia, los resultados adversos en el neurodesarrollo ocurren más frecuentemente en infantes prematuros y/o infantes de alto riesgo. Se han identificado factores de riesgo médicos para desvíos del neurodesarrollo como el sexo masculino o el retraso del crecimiento intrauterino y características socioculturales de la familia. Se han provisto datos significativos de evidencia del impacto nocivo de los abrumadores estímulos sensoriales ambientales, tales como el dolor y estrés, sobre el cerebro humano en desarrollo y estrategias dirigidas a prevenir este impacto. Estas estrategias, tales como el libre acceso de los padres o protección del sueño, podrían ser consideradas “principios de cuidado”. La implementación de estos principios no requiere investigación adicional debido a la cantidad de evidencia. Aquí nosotros revisamos la evidencia científica para estos principios.

La prematuridad es un problema de salud pública porque involucra alrededor del 8% de los nacidos vivos. Las mejoras recientes en el cuidado médico perinatal han llevado a un dramático aumento en las tasas de supervivencia. Las tasas de supervivencia son de 93.6% para infantes nacidos entre las 27 y 31 semanas de gestación y 98.9% entre las 32 y 34 semanas de gestación (1). La supervivencia entre infantes extremadamente prematuros nacidos antes de las 27 semanas alcanza al 70% (2). Desafortunadamente, los resultados adversos en el neurodesarrollo, incluyendo déficits cognitivo, lenguaje, visuo- perceptivo, sensoriales, y atención y aprendizaje, ocurren con más frecuencia en infantes pretérmino (3). Pese a que se han descrito principalmente en infantes nacidos muy pretérmino, estas anomalías también pueden ocurrir en infantes pretérmino tardíos (4). Se han identificado factores de riesgo médico para retrasos del neurodesarrollo como sexo masculino, sepsis y restricción del crecimiento intrauterino(5-7). La exposición al dolor y/o estímulos ambientales estresantes también pueden ser fuentes potenciales de desarrollo cerebral alterado (8, 9). Las características familiares socioculturales también están asociadas a los resultados (10).

“Neonatología ambiental”, “cuidado del cerebro” o “cuidado del desarrollo” son términos utilizados para describir estrategias no farmacológicas dirigidas a prevenir el impacto deletéreo de los abrumadores procedimientos y estímulos sensoriales sobre el cerebro en desarrollo del neonato (11). Es necesaria más investigación en este campo (12). No obstante, algunos

procedimientos deben ser implementados inmediatamente, sin investigación adicional, porque ya se ha alcanzado un grado razonable de evidencia y/o por razones éticas. En 2005, la Red Europea de Investigación sobre Cuidado temprano del Desarrollo ESF (13) sugirió que ocho procedimientos podrían ser considerados “principios de cuidado”. Diez años más tarde, una suma significativa de datos refuerza la necesidad de una implementación más alta de estos principios. Aquí revisamos la evidencia científica para estos principios (Tabla 1).

Tabla 1 . Evidencia de los 8 principios del cuidado centrado en la familia		
Nº	Estándar	Naturaleza de la evidencia
1	Acceso libre a los padres 24 hs	Enfoque Humano
2	Soporte psicológico a los padres	Metanálisis
3	Manejo del dolor	Metanálisis
4	Influencia del ambiente	Estudios Observacionales
5	Soporte postural	Metanálisis
6	Contacto piel a piel	Metanálisis
7	Apoyo de la lactancia y alimentación al pecho	Metanálisis
8	Protección del sueño	Estudios animales

PRINCIPIO 1: LIBRE ACCESO DE LOS PADRES LAS 24 HORAS DEL DÍA SIN LIMITACIONES POR CAMBIOS DE TURNO DE PERSONAL O RONDAS MÉDICAS

Argumentos filosóficos, psicológicos y neurocientíficos justifican la presencia de la familia en la unidad. Un elemento clave de la filosofía del cuidado centrado en la familia es que la familia es la constante en la vida del niño y su fuente primaria de fuerza y apoyo (14). Acorde a la declaración de la Asociación Europea para Niños en el Hospital, “Niños y gente joven internados en hospital u otros servicios de salud tienen el derecho de tener a sus padres o sustitutos con ellos en cualquier momento, lugar, las 24 horas del día, sin importar la edad del niño o persona joven” (15). De la misma forma, La Convención de los Derechos del Niño establece que un niño tiene el derecho “a ser cuidado por su/s padres” y no ser separados de ellos contra su voluntad (16).

La presencia de los padres a lo largo de la hospitalización y su compromiso en el cuidado de su hijo ha sido asociada a menor prevalencia de retinopatía de la prematuridad (17). Algunos estudios también la asociaron con una estadía hospitalaria más corta y reducción del riesgo de DBP moderada a severa (18). También son importantes de considerar algunos aspectos del desarrollo. El proceso de vínculo y apego está basado en la proximidad cercana entre madre e hijo y las reacciones que va adaptando la madre a los reclamos de su hijo (19). Varios estudios apoyan la existencia de un período sensible para el vínculo y el apego en los niños prematuros similar al de los niños de término (20). La capacidad de los padres de ajustarse a la situación de un nacimiento prematuro y la calidad de la relación padres-hijo temprana son aspectos críticos que se ha sugerido impactan fuertemente en las competencias del infante y el desarrollo posterior (21). Este proceso puede ser alterado durante la estadía en la UCIN debido a la separación física y la vulnerabilidad psicológica de la madre. Debido a que el proceso de apego está apoyado por la proximidad de padre e hijo, el acceso libre al bebé es necesario como punto preliminar. El segundo es la intervención psicológica para los padres.

PRINCIPIO 2: APOYO PSICOLÓGICO A LOS PADRES

Los padres de los infantes recién nacidos hospitalizados están expuestos a una experiencia traumática y estresante que podría llevar a enfermedad por estrés agudo y/o estrés post-traumático (22). Esta alteración puede tener un impacto negativo sobre el futuro desarrollo del niño (23). Un estado psicológico deteriorado en los padres parece estar asociado con trastornos del comportamiento de los infantes MBPN (24). Según un reciente meta-análisis, las intervenciones educacionales y conductuales tempranas enfocadas en la adaptación y autorregulación reducen los síntomas de trauma psicológico en las madres después de un nacimiento prematuro (25). Entonces, el apoyo psicológico de los padres está enfocado en la educación parental y el apoyo terapéutico del desarrollo para el infante, un componente esencial de la intervención temprana (26)

PRINCIPIO 3: MANEJO DEL DOLOR

Los neonatos hospitalizados están expuestos a numerosos noxas. Una revisión sistemática de estudios observacionales identificó un promedio de 7.5-17.3 procedimientos invasivos por neonato y por día asociados con frecuencia con manejo inadecuado del dolor (27), siendo los neonatos más inmaduros los que sobrellevan las experiencias más dolorosas. La exposición neonatal al dolor ha sido identificada como significativamente asociada con cambios específicos en el desarrollo cerebral en esta población (28). La prevención del dolor, evaluación, y tratamiento son responsabilidades importantes de los profesionales de la UCIN. La evaluación del dolor debiera estar basada en medidas multidimensionales utilizando escalas compuestas validadas (29). Dos escalas tienen ajustes métricos para prematuridad (la PIPP y N-PASS). Sólo dos escalas, EDIN y N-PASS, han demostrado validez y confiabilidad para el dolor neonatal prolongado (30). Los prestadores deben ser entrenados regularmente para asegurar el uso afinado de las herramientas y para evitar la variabilidad inter-observador (30).

El tratamiento del dolor es un tema crítico. Los enfoques no farmacológicos están basados en evidencia científica. Según un meta-análisis Cochrane reciente, las intervenciones acompañadas de succión no nutritiva, alimentación al pecho, sucrosa y arropamiento/envuelto son eficientes para reducir la reactividad al dolor durante procedimientos invasivos en infantes recién nacidos pretérmino (31-33).

Pese a que el tratamiento farmacológico del dolor puede ser útil y efectivo, los efectos de salud se preocupan acerca de la neurotoxicidad de las drogas como se demostró en modelos animales. No se pueden extraer conclusiones definitivas en cuanto al impacto negativo de la morfina neonatal sobre la evolución a largo plazo del neurodesarrollo en infantes prematuros (34). La AAP (35) y la Sociedad Canadiense de Pediatría (36) recomiendan premedicación de rutina, incluidos opiáceos, para todas las intubaciones endotraqueales no urgentes, en neonatos. Debido a su rápida acción, el fentanilo parece ser el opioide más apropiado en este caso, comparado con morfina. El paracetamol puede ser útil para espaciar la morfina postoperatoria después de una cirugía mayor, pero el paracetamol es inefectivo para reducir el dolor neonatal por procedimientos y no debería ser usada para este propósito (37). En neonatos pretérmino ventilados, tratar el dolor y el estrés episódicamente es lo recomendado sin preferencia por ningún opioide (38).

PRINCIPIO 4: AMBIENTE DE APOYO

Los infantes pretérmino y recién nacidos de alto riesgo están expuestos a estímulos sensoriales muy diferentes de los del ambiente uterino durante un período crítico del desarrollo cerebral incluyendo luces excesivas y exceso de sonido (39, 40). Lasky y Williams demostraron que neonatos EBPN están expuestos a niveles de sonido promediando 56.44 dB (A) y niveles de luz promediando 70.56 lux durante su estadía desde las 26 a 42 semanas de edad postmenstrual en la UCIN (39). Los infantes pretérmino pueden reaccionar a moderadas variaciones de sonido o luz, que pueden afectar su bienestar psicológico y conductual (41-43). Este ambiente podría también impactar negativamente la calidad y duración del sueño que puede alterar el desarrollo del cerebro (40). Controlar la calidad ambiental de la UCIN es fundamental. El nivel de sonido no debería exceder los 50 dB, con picos <65 dB (44). La exposición temprana a la voz de los padres parece ser importante para el desarrollo cognitivo y del lenguaje del infante (45). Los niveles de luz del ambiente en los espacios del bebé deberían ser ajustables a través de un rango de al menos 10-600 lux, con acceso a luz de día natural (44). Luces cicladas parecen ser beneficiosas comparadas con la casi oscuridad o la luz brillante continua (46).

PRINCIPIO 5: CONTROL POSTURAL

La postura del neonato en la incubadora está generalmente guiada por metas respiratorias. Desafortunadamente, la eficiencia de posiciones corporales particulares en infantes recién nacidos pretérmino con apnea o con ventilación mecánica para producir mejoras clínicamente relevantes no ha sido demostrada (47, 48). El posicionamiento inapropiado puede llevar a anomalías en el tono muscular en recién nacidos pretérmino (49). Más aún, los recién nacidos pretérmino en posiciones de extensión sin apoyo pueden exhibir estrés y agitación (50). Por lo tanto, los objetivos del apoyo postural son prevenir deformidades músculo esqueléticas y favorecer el desarrollo conductual general. Los objetivos generales de posicionar al infante prematuro en la incubadora son promover la flexión, facilitar la actividad mano-boca, facilitar la orientación hacia la línea media y la postura simétrica, apoyar el movimiento y la postura, optimizar el desarrollo y alineación del esqueleto, promover un estado calmo y prevenir deformidades craneanas y tortícolis (51). Arrojarlos envolviendo apropiadamente por cuidadores calificados mejora el desarrollo neuromuscular y la organización motora, disminuye el estrés psicológico y apoya la capacidad autorregulatoria de los infantes prematuros (52). La contención de las manos o facilitar agarrarse las manos, esto es, mantener los brazos y las piernas del infante en posición flexionada cercana a la línea media del cuerpo, parece ser eficiente para reducir síntomas de dolor durante los procedimientos (53). Utilizar nidos facilita los movimientos hacia y a través de la línea media, y reduce los movimientos abruptos y las posturas fijas de brazos y piernas (54). En infantes recién nacidos sin monitoreo cardiopulmonar, es necesario respetar las recomendaciones para reducir el riesgo de síndrome de muerte súbita (55).

PRINCIPIO 6: CONTACTO PIEL A PIEL

El contacto piel a piel entre los infantes pretérmino y sus padres ha sido asociado con un riesgo disminuido de mortalidad, infección severa/sepsis, hipotermia e hipoglucemia, estadía hospitalaria más corta, aumento del crecimiento del infante y alimentación al pecho y apego madre-hijo (56, 57) así como mayor satisfacción de los padres, llevando a mejor organización del sueño, y percepción del dolor disminuid durante los procedimientos (58). El contacto piel a piel es recomendado por la OMS para mejorar los resultados del nacimiento prematuro (59) y

por la AAP y la Sociedad Canadiense de Pediatría (58, 60). El contacto piel a piel puede ser continuo o intermitente en todos los niveles de cuidado neonatal tanto en ámbitos de bajos recursos como en países desarrollados (59, 61).

PRINCIPIO 7: ALIMENTACIÓN AL PECHO Y APOYO A LA LACTANCIA

La alimentación al pecho tiene beneficios a corto y largo plazo para la salud de los infantes pretérmino. La alimentación al pecho o por sonda, con leche de la propia madre reduce el riesgo de enfermedad severa como por ejemplo, enterocolitis (62). El impacto sobre la sepsis neonatal es menos claro (63). Amamantar también tiene efecto positivo a largo plazo sobre el neurodesarrollo (64), con un posible efecto de dosis según volumen y duración de la alimentación con eche de la propia madre (65). Según la Sociedad Europea de Gastroenterología, Hepatología y Nutrición Pediátrica (66) la iniciativa Hospital Amigo del Niño (BFHI) (67), la leche fresca de la propia madre es la primera opción en la alimentación del infante pretérmino. Cuando no está disponible, la leche humana de donante fortificada es la alternativa recomendada (66).

Establecer lactancia materna exclusiva en infantes pretérmino está asociado con factores del infante, de la madre y de la práctica clínica (68). La práctica clínica debiera adaptarse al BFHI, que provee recomendaciones basadas en la evidencia sobre cómo proteger, promover, y apoyar la alimentación al pecho en UCINs (67, 69, 70). Los Diez Pasos y los Tres Principios Guías incluyen inicio temprano de la expresión del pecho, iniciación temprana de la alimentación al pecho teniendo como único criterio la estabilidad del infante, no separar a la madre y el niño, contacto piel a piel, y cuidado centrado en la familia.

PRINCIPIO 8: PROTECCIÓN DEL SUEÑO

El sueño es una función fisiológica mayor en mamíferos y juega un importante rol en el desarrollo del cerebro (71). El sueño puede ser interrumpido en la UCIN por factores ambientales tales como sonidos y niveles de luz no ajustados y/o procedimientos médicos y de enfermería (42). Por razones éticas, nunca se ha estudiado el efecto de la privación de sueño en infantes pretérmino hospitalizados. En niños de término sanos, la privación corta del sueño está asociada con el desarrollo de apnea obstructiva y aumento significativo de los umbrales de despertar (72). La investigación de modelos animales demostró cambios en los patrones respiratorios, alteró el aprendizaje subsiguiente, y efectos a largo plazo sobre el comportamiento y la función cerebral debido a privación de sueño durante el período neonatal (73). Todos estos datos promueven la necesidad de proteger el sueño en la UCIN. Los patrones de sueño requieren cuidadosa observación en infantes MPT, y en la medida que se encuentran rápidos cambios de estado, perturbar a los infantes en su transición al sueño puede ser contraproducente.

APLICANDO ESTOS 8 PRINCIPIOS

Se han observado brechas entre la evidencia y la práctica en UCINs, con grandes diferencias entre unidades dentro y entre países en Europa, con una brecha Norte-Sur (74- 77). Cambios de conducta en los profesionales de la salud, padres, y organizaciones a través del compromiso y liderazgo son cruciales (78). Los primeros pasos de la implementación son evaluar y apuntar a las barreras potenciales y facilitadores; el entrenamiento es también un componente mayor. La

flexibilidad del proceso de implementación es necesaria en relación al contexto cultural a través de un enfoque cíclico y de largo plazo.

Algunas estrategias están siendo utilizadas actualmente en Europa y prometen buenos resultados. En primer lugar hay programas estructurados e individualizados de cuidado del desarrollo centrado en el paciente y la familia, comenzando al nacer desde que el NIDCAP ha mostrado resultados promisorios (79). Segundo, el apoyo a la lactancia materna utilizando el BFHI en la maternidad y en la UCIN ha sido eficiente en aumentar las tasas de amamantamiento (69, 80). Tercero, organizaciones de padres, nacionales o internacionales podrían jugar un rol importante en desarrollar e implementar estándares internacionales de cuidado como muestra la Fundación Europea para el cuidado de los Infantes recién nacidos por medio del proyecto Estándares Europeos de Cuidado de la Salud del Recién nacido (81).

CONCLUSIÓN

Estos ocho principios están basados en evidencia de alto nivel. Las necesidades de los infantes y sus familias durante este período crítico neonatal son universales; por lo tanto, los esfuerzos para implementar estos estándares en todas las unidades en todos los países son necesarios.

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Eight principles for patient-centred and family-centred care for newborns in the neonatal intensive care unit

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ABSTRACT

Despite the recent improvements in perinatal medical care leading to an increase in survival rates, adverse neurodevelopmental outcomes occur more frequently in preterm and/or high-risk infants. Medical risk factors for neurodevelopmental delays like male gender or intrauterine growth restriction and family sociocultural characteristics have been identified. Significant data have provided evidence of the detrimental impact of overwhelming environmental sensory inputs, such as pain and stress, on the developing human brain and strategies aimed at preventing this impact. These strategies, such as free parental access or sleep protection, could be considered 'principles of care'. Implementation of these principles do not require additional research due to the body of evidence. We review the scientific evidence for these principles here.

Prematurity is a public health issue because it includes about 8% of live births. Recent improvements in perinatal medical care have led to a dramatic increase in survival rates. Survival rates are 93.6% for infants born between 27 and 31 weeks of gestation and 98.9% between 32 and 34 weeks of gestation.¹ Survival among extremely preterm infants born before 27 weeks of gestation is up to 70%.² Unfortunately, adverse neurodevelopmental outcomes, including cognitive, language, visual-perceptual, sensory, and attention and learning deficits, occur more frequently in preterm infants.³ Although mainly described in infants born very preterm, these developmental abnormalities may also occur in late preterm infants.⁴ Medical risk factors for neurodevelopmental delays have been identified as male gender, sepsis and intrauterine growth restriction.^{5–7} Exposure to painful experiences and/or stressful environmental stimuli may also be potential sources of altered brain development.^{8–9} Family sociocultural characteristics are also associated with outcomes.¹⁰

'Environmental neonatology', 'brain care' or 'developmental care' are terms used to describe non-pharmacological strategies aimed at preventing the detrimental impact of overwhelming sensory input and procedures on the developing newborn brain.¹¹ More research is needed in this field.¹² Nevertheless, some procedures need to be implemented immediately, without additional research, because a reasonable level of evidence was recently reached and/or for ethical reasons. In 2005, the ESF European Research Network on Early Developmental Care¹³ suggested that eight procedures could be considered 'principles of care'. Ten years later, a significant

amount of data reinforces the need for broader implementation of these principles. We review the scientific evidence for these principles here (table 1).

PRINCIPLE 1: FREE 24 HOURS A DAY PARENTAL ACCESS WITH NO LIMITATIONS DUE TO STAFF SHIFT OR MEDICAL ROUNDS

Philosophical, psychological and neuroscientific arguments justify the presence of the family in the unit. A key element of the family-centred care philosophy is that the family is the constant in a child's life and his primary source of strength and support.¹⁴ According to the European Association for Children in Hospital charter, 'Children and young people in hospital and other healthcare services shall have the right to have their parents or parent substitutes with them anytime, anywhere, any place, 24-hours a day, regardless of the age of the child or young person'.¹⁵ In the same way, the Convention on the Rights of the Child states that a child has the right 'to be cared for by his or her parents' and not to 'be separated from his or her parents against their will'.¹⁶

Parents' presence throughout hospitalisation and their involvement in their child's care has been linked to a lower prevalence of retinopathy of prematurity.¹⁷ Some studies also associated it with a reduced total length of stay and a reduced risk of moderate-to-severe bronchopulmonary dysplasia.¹⁸ Developmental aspects are also important to consider. The bonding and attachment process is based on the close proximity between mother and child and the mother's adapted reactions to her newborn's cues.¹⁹ Several studies support the existence of a sensitive bonding and attachment period in premature children similar to that in full-term newborns.²⁰ The parent's ability to adjust to the situation of a premature birth and the quality of the early parent-infant relationship are critical aspects strongly suggested to impact the infant's competencies and development later.²¹ This process can be disrupted during neonatal intensive care unit (NICU) hospitalisation because of the physical separation and the mother's psychological vulnerability. Because the attachment process is supported by the proximity of the parent and child, free access to the baby is necessary at the preliminary point. The second is the psychological intervention for parents.

PRINCIPLE 2: PSYCHOLOGICAL SUPPORT FOR PARENTS

Parents of hospitalised newborn infants are exposed to a traumatic and stressful experience that

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Table 1 Evidence for the eight principles for family-centred care

No	Standard	Nature of evidence (ref)
1	Free 24 hours/24 parental access	Human approach
2	Psychological parental support	Meta-analysis
3	Pain management	Meta-analysis
4	Environmental influences	Observational studies Meta-analysis
5	Postural support	Meta-analysis
6	Support of skin to skin	Meta-analysis
7	Lactation and breastfeeding support	Meta-analysis
8	Sleep protection	Animal studies

could lead to acute stress disorder and/or post-traumatic stress disorder.²² This disorder can have a negative impact on the child's future development.²³ A poor parental psychological well-being seems to be associated with behavioural problems of very low birthweight infants.²⁴ According to a recent meta-analysis, early educational and behavioural interventions focused on coping and self-regulation reduce the symptoms of psychological trauma in mothers following a preterm birth.²⁵ Thus, the parents' psychosocial support is focused on parenting education and therapeutic developmental support for the infant, an essential component of early intervention.²⁶

PRINCIPLE 3: PAIN MANAGEMENT

Hospitalised neonates are exposed to numerous noxious events. A systematic review of observational studies identified an average of 7.5–17.3 invasive procedures per neonate per day associated with frequent inadequate pain management,²⁷ with the most immature neonates having the more painful experiences. Neonatal exposure to pain has been identified as being significantly associated with specific changes in brain development in this population.²⁸ Pain prevention, assessment, and treatment are important responsibilities of NICU professionals. Assessment of pain should be based on multidimensional measures using validated composite scales.²⁹ Two scales have metric adjustments for prematurity (the PIPP and the N-PASS). Only two scales, EDIN and N-PASS, have demonstrated validity and reliability for prolonged neonatal pain.³⁰ Providers must be trained regularly to ensure accurate use of the tools and to avoid inter-observer variability.³⁰

Treatment of pain is a critical issue. Non-pharmacological approaches are based on scientific evidence. According to a recent Cochrane meta-analysis, non-nutritive sucking-related interventions, breast feeding, sucrose and swaddling/facilitated tucking are efficient in reducing pain reactivity during invasive procedures in preterm newborn infants.^{31–33}

Although pharmacological treatment of pain may be useful and effective, practitioners worry about the neurotoxicity of drugs as demonstrated in animal models. No definite conclusions can be drawn concerning the negative impact of neonatal morphine on long-term neurodevelopmental outcomes in premature neonates.³⁴ The American Academy of Paediatrics³⁵ and the Canadian Paediatric Society³⁶ recommend routine premedication, including opiates, for all non-emergency endotracheal intubations in newborns. Because of its rapid onset, fentanyl seems to be the most appropriate opioid in this case compared with morphine. Paracetamol may be helpful for post-operative morphine sparing after major surgery, but paracetamol is ineffective for reducing neonatal procedural pain and should

not be used for this purpose.³⁷ In ventilated preterm neonates, treating pain and stress episodically is recommended with no clear advantage for any opioids.³⁸

PRINCIPLE 4: SUPPORTIVE ENVIRONMENT

Preterm and high-risk newborn infants are exposed to sensory stimuli very different from the in utero environment during a critical period of brain development including aberrant light and excess sound.^{39–40} Lasky and Williams demonstrated that extremely low birthweight neonates are exposed to noise levels averaging 56.44 dB(A) and light levels averaging 70.56 lux during their stay from 26 to 42 weeks of postmenstrual age in the NICU.³⁹ Preterm infants can react to even moderate variations of sound or light, which can affect their psychological and behavioural well-being.^{41–43} This environment could also negatively impact the quality and duration of sleep which could alter brain development.⁴⁰ Controlling the quality of the NICU environment is crucial. The sound level should not exceed 50 dB, with peaks <65 dB.⁴⁴ Early exposure to the parents' voice seems to be important for the infant's cognitive and language development.⁴⁵ Ambient lighting levels in infant spaces should be adjustable through a range of at least 10–600 lux, with access to natural daylight.⁴⁴ Cycled lights seem beneficial compared with near darkness or continuous bright light.⁴⁶

PRINCIPLE 5: POSTURAL SUPPORT

Positioning the neonate in the incubator is often driven by respiratory goals. Unfortunately, the efficiency of particular body positions in preterm newborn infants with apnoea or under mechanical ventilation in producing clinically relevant improvements was not demonstrated.^{47–48} Inappropriate positioning can lead to abnormalities in muscle tone in preterm newborns.⁴⁹ Moreover, preterm newborn infants in unsupported extended positions can exhibit increased stress and agitation.⁵⁰ Therefore, the objectives of postural support are to prevent musculoskeletal deformities and to enhance general behavioural development. The general goals of positioning the preterm infant in the incubator are to promote flexion, facilitate hand-to-mouth activity, facilitate midline orientation and symmetrical positioning, support posture and movement, optimise skeletal development and alignment, promote a calm state and prevent head deformities and torticollis.⁵¹ Appropriate swaddling by qualified caregivers improves neuromuscular development and motor organisation, decreases physiologic distress and supports self-regulatory ability in preterm infants.⁵² Hand containment or facilitated tucking, that is, holding the infant's arms and legs in a flexed position close to the midline of the body, seems efficient for reducing pain symptoms during procedures.⁵³ Using a nest facilitates movements towards and across the midline, and reduces abrupt movements and frozen postures of the arms and legs.⁵⁴ In newborn infants with no cardiopulmonary monitoring, respecting recommendations for sudden infant death syndrome risk reduction is necessary.⁵⁵

PRINCIPLE 6: SKIN-TO-SKIN CONTACT

Skin-to-skin contact between preterm infants and their parents has been associated with a decreased risk of mortality, severe infection/sepsis, hypothermia and hypoglycaemia, shortened the length of hospital stay, increased infant growth and breast feeding and mother–infant attachment^{56–57} as well as increasing parents' satisfaction, leading to better sleep organisation, and decreasing pain perception during procedures.⁵⁸ Skin-to-skin contact is recommended by the WHO to improve preterm birth outcomes⁵⁹ and by the American Academy of Pediatrics and the

Canadian Paediatric Society.^{58 60} Skin-to-skin contact can be performed continuously or intermittently at all the levels of neonatal care in both low-income settings and developed countries.^{59 61}

PRINCIPLE 7: BREAST FEEDING AND LACTATION SUPPORT

Breast feeding has both short-term and long-term health benefits for preterm infants. Breast feeding or tube feeding with the infant's own mother's milk (OMM) reduces the risk of severe disease such as enterocolitis.⁶² The impact on neonatal sepsis is less clear.⁶³ Breast feeding also has a positive long-term influence on neurodevelopment,⁶⁴ with a possible dose effect on the volume and duration of feeding OMM.⁶⁵ According to the European Society for Pediatric Gastroenterology, Hepatology, and Nutrition⁶⁶ and the Baby-Friendly Hospital Initiative for Neonatal wards (BFHI),⁶⁷ fresh OMM is the first choice in preterm infant feeding. When OMM is not available, fortified donor human milk is the recommended alternative.⁶⁶

Establishing exclusive breast feeding in preterm infants is associated with factors in the infant, mother and clinical practice.⁶⁸ Clinical practice should adapt the BFHI, which provides evidence-based recommendations on how to protect, promote, and support breast feeding in NICUs.^{67 69 70} The Ten Steps and Three Guiding Principles include early initiation of breast milk expression, early initiation of breast feeding with infant stability as the only criterion, non-separation of mother and infant, skin-to-skin contact, and family-centred care.

PRINCIPLE 8: SLEEP PROTECTION

Sleep is a major physiological function in mammals and plays an important role in brain development.⁷¹ Sleep can be disrupted in the NICU by environmental factors such as unadjusted sound and light levels and/or medical and nursing procedures.⁴² For ethical reasons, the effect of sleep deprivation in hospitalised preterm newborn infants has never been studied. In healthy full-term infants, short-term sleep deprivation is associated with the development of obstructive apnoea and significant increases in arousal thresholds.⁷² Research in animal models demonstrated changes in respiratory patterns, altered subsequent learning, and long-term effects on behaviour and brain function due to sleep deprivation during the neonatal period.⁷³ All these data promote the need to protect sleep in the NICU. Sleep patterns need careful observation in very preterm infants and, as rapid changes of state are found, disturbing infants as they are transitioning to sleep may be unhelpful.

IMPLEMENTING THESE 8 PRINCIPLES

Gaps between evidence and practice have been observed in NICUs, with large differences between units within and between countries in Europe, with a North-South gap.⁷⁴⁻⁷⁷ Behavioural changes in healthcare professionals, parents and organisations through engagement and leadership are crucial.⁷⁸ Evaluating and targeting potential barriers and facilitators are the first steps of implementation; training is also a major component. Flexibility in the implementation process is necessary in relation to the cultural context through a cyclical and long-term approach.

Some strategies are currently used in Europe and offer promising results. First are structured and individualised patient-centred and family-centred developmental care programmes starting at birth since the NIDCAP has shown promising results.⁷⁹ Second, support for breast feeding and lactation using the BFHI in the maternity ward and the NICU has been efficient in increasing breastfeeding rates.^{69 80} Third, national or

international parent organisations could play an important role in developing and implementing international standards of care as shown by the European Foundation for the Care of Newborn Infants through the European Standards of Care for Newborn Health project.⁸¹

CONCLUSION

These eight principles are based on a high level of evidence. Infants' and families' needs during this critical neonatal period are universal; therefore, efforts to implement these standards in all units in all countries are needed.

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