



Intervenciones de Enfermería para promover el desarrollo neurológico

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GOIÂNIA



- second most populous city in Brazil's Midwest
- has largest green area per inhabitant in Brazil







NICU environment

pain

3-14/proc/day
300 proc in 14 days
20-40% treatment

(BONUTTI, 2014; CARBAJAL et al., 2008)

Excessive
handling

59-109 handlings/24 hs
240 caregivers/4 months
uninterrupt rest: 4.6-9.2 min

(PEREIRA et al., 2013; CONSENTINO; MALERBA, 1996)

NICU Leq > 60dBA
HP and family talk

Intense noise

(LAHAV, 2014; ZAMBERLAN et al., 2008)

Continous light

Sleep deprivation
Endocrinal changes

Family
separation



PREMATURITY – LONG TERM OUTCOMES

PHYSICAL EFFECTS

OUTCOME	EXEMPLE	FREQUENCY
Visual impairment	Blindness or high myopia after ROP	25% extremely PT
	Increased hypermetropia and myopia	Moderately preterm babies especially if poorly monitored oxygen therapy
Hearing impairment		5-10% extremely PT
Chronic lung disease	From reduced exercise tolerance to requirement for home oxygen	Up to 40% extremely PT
Cardiovascular ill-health and non-communicable disease	Increased blood pressure Reduced lung function Increased rates of asthma Growth failure in infancy, accelerated weight gain in adolescence	Not quantified

Source: WHO, Born too soon, 2012

PREMATURITY – LONG TERM OUTCOMES

NEURODEVELOPMENTAL/BEHAVIORAL EFFECTS

OUTCOMES	EXEMPLE	FREQUENCY
Mild disorders of executive functioning	Specific learning impairments, dyslexia, reduced academic achievement	
Moderate to severe global developmental delay	Moderate/severe cognitive impairment Motor impairment Cerebral palsy	Affected by GA and quality of care dependent
Psychiatric/ behavioral sequelae	Attention deficit hyperactivity disorder Increased anxiety and depression	

Source: WHO, Born too soon, 2012

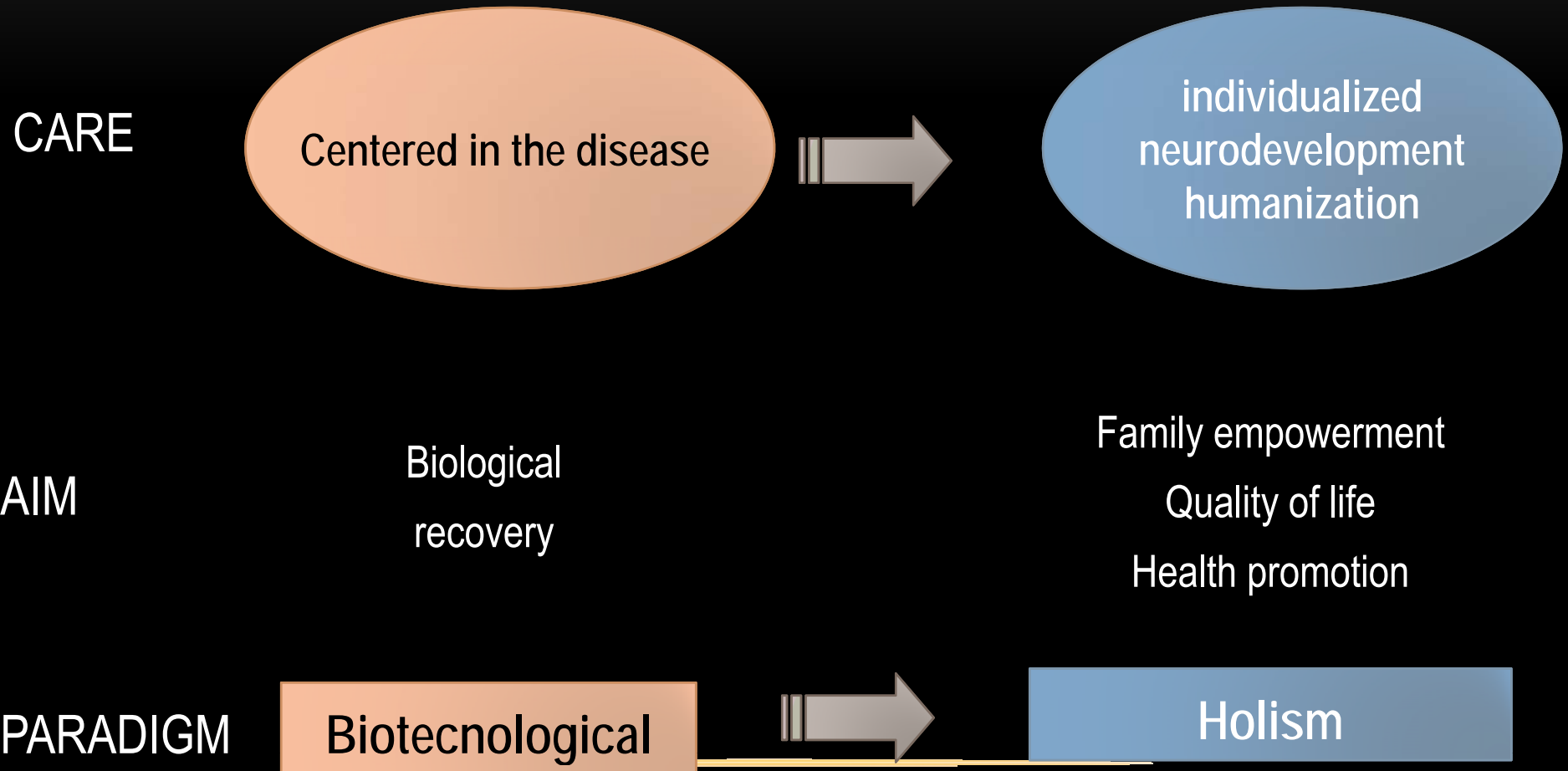
PREMATURITY – LONG TERM OUTCOMES

FAMILY, ECONOMY AND SOCIETY

OUTCOME	EXEMPLE	FREQUENCE
Family	Psychosocial, emotional and economic	Common varying with medical risk factors, disability, socioeconomic status
Health services	Cost of care [h] – acute, and ongoing	
Intergenerational	Risk of preterm birth in offspring	

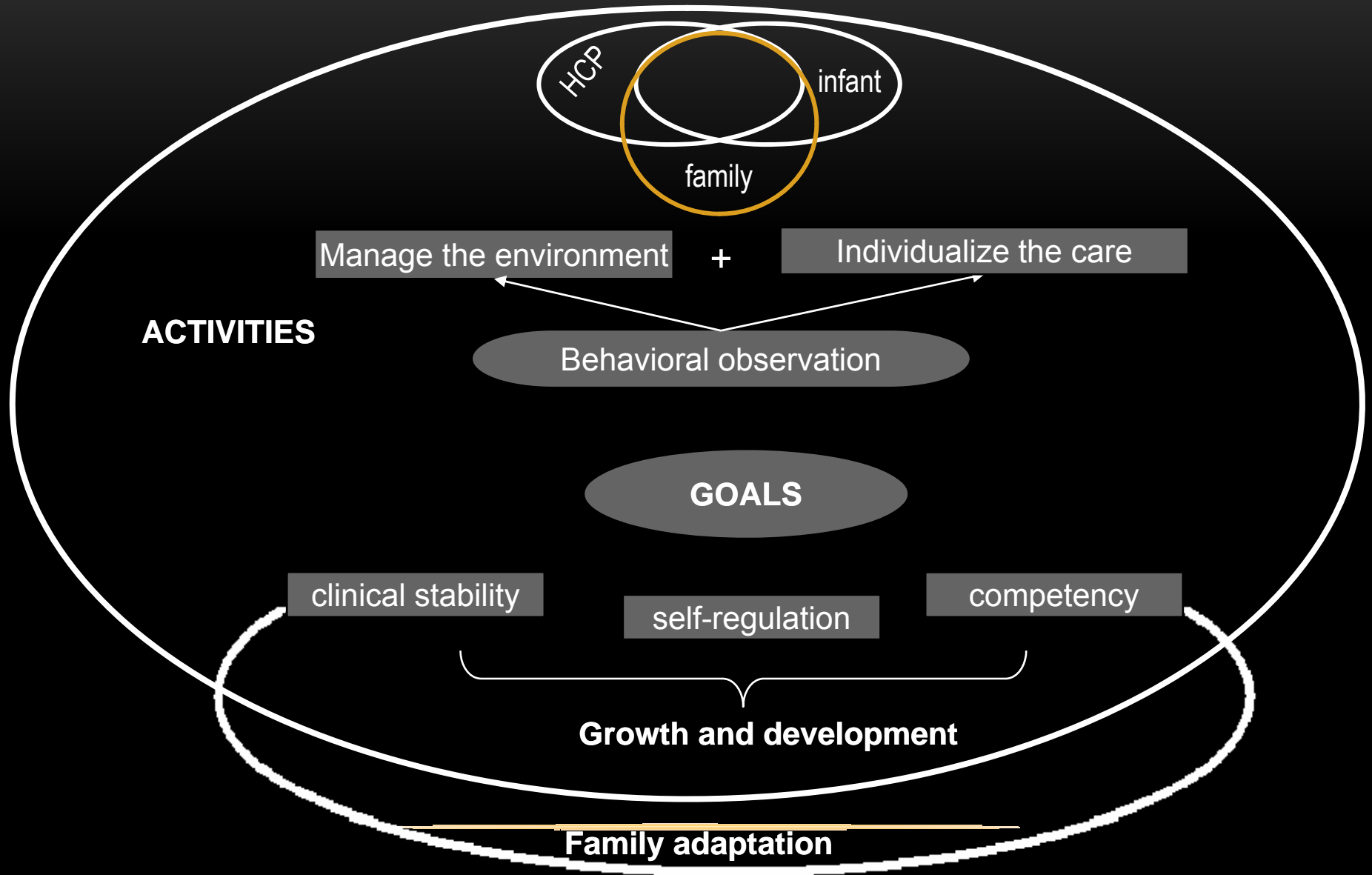
Costs related to prematurity (EUA) were estimated in \$26.2 billions (2005). Only in the first year costs were equivalent to \$32.325,00.

Historical changes in the neonatal care



(Aucott et al., 2002)

Theoretical foundations for developmental care



(ALS, 1986; BYERS, 2003; SIZUN; WESTRUP, 2004; BUSTANI, 2008)

NIDCAP - SYNACTIVE THEORY OF DEVELOPMENT (ALS, 1982)

- based on the assumption that the infant actively and consistently communicates through his/her behavior the thresholds for sensitivity vs. competence.
- the infant's ability to regulate and control behavior emerges through continued interaction with the environment (womb, NICU, home)
- 5 interdependent and interrelated systems (stability vs. stress)
 - autonomic/physiology (ex.: respiration, color change, tremulousness)
 - motor (ex.: posture, tone)
 - state (ex.: sleep/awake)
 - attention/interaction and self-regulation (ex.: ease of coming to an alert state or recovery from stress)

(Als et al., 2005; Vandenberg, 2007)

SIGNS OF STRESS IN THE PRETERM

AUTONOMIC

apnea,
tachypnea,
cyanosis, tremor,
sneezing,
hiccups, yawning,
gasp

MOTOR

hypertonicity of
the arms or legs,
arched trunk,
fingers display,
fist, pain face,
hand on face



(Als et al., 1982)

ALERT

sleep / diffuse
alert with
whimpers, facial
spasms,
irritability, sleep
state oscillation /
alert, crying

SELF REGULATION

calm breathing,
good tone,
synchronous mov.
hand to mouth,
bending fingers,
quiet face,
sucking



stressed and hyperalert



animated and engaged

Source: Als et al. The assessment of preterm infants' behavior (APIB): furthering the understanding and measurement of neurodevelopmental competence in preterm and full-term infants. *Mental retardation and Developmental Disabilities Research Reviews*, 11: 94–102, 2005



Developmental
care



EFFECTS OF NOISE

changes HR, RR, blood pressure, ↓ SO_2 , prolonged alert state

(ZHR; BALIAN, 2000)

Motor reflex responses, facial action and sleep/wake change (RODARTE, 2007)



Feeding problems

(LOTAS, 1992)

> 70dB
agitation, cry

↓ TcO_2 ,

(FONSECA, 1986; MARRESE, 1996)

≥ 60dB
sleep disturbance

(GRAVEN, 2000)

potentiates ototoxic agents

(KENT et al., 2002)

NEURODEVELOPMENTAL INTERVENTIONS

NOISE REDUCTION

- Infrastructure
 - Eliminate radio and telephone, keep doors closed, set up partitions, visual alarms, set a “noise thermometer”
- Equipments
 - Equipments maintenance, absorbing springs, measure noise
- Human resources
 - Respond quickly to alarms/cry, close incubator portholes and drawers quietly, remove water from extensions, do not put materials on top of incubator, rubber soled shoes without heels, implement “nap time”, talk at low pitch

**Permanent
education**

Leq 62.5dBA
to 58.8dBA

(Zamberlan-Amorim et al., 2012)

Recommendations

AAP (1997) 45dBA
Committee (2007) L_{eq} 45dBA

NEURODEVELOPMENTAL INTERVENTIONS

LIGHT REDUCTION

- Cochrane systematic review examined the effects of bright reduction in the growth of the PT infant at 3 and 6 months of CA
- 6 studies (n=506 PT)
- **Day/night cycles (12h light + 12h no light)** vs. close to dark vs. continuous artificial light
- > weight gain, ↓ hospitalization duration (- 13 days), ↓ cry duration (- 0.57h), ↓ ventilator days (- 18.2 days), ↓ time to 1st oral feeding (-6.8 days)

NEURODEVELOPMENTAL INTERVENTIONS

LIGHT REDUCTION

- avoid direct light, except for procedures
- individualize infant exposure to light
- implement day/nigh cycles
- cover incubator with blankets
- observe individual tolerance



LIGHT LEVES – 1FC/10lux

UCIN (US)	24 – 148 FC
phototherapy lamps	300 – 400 FC

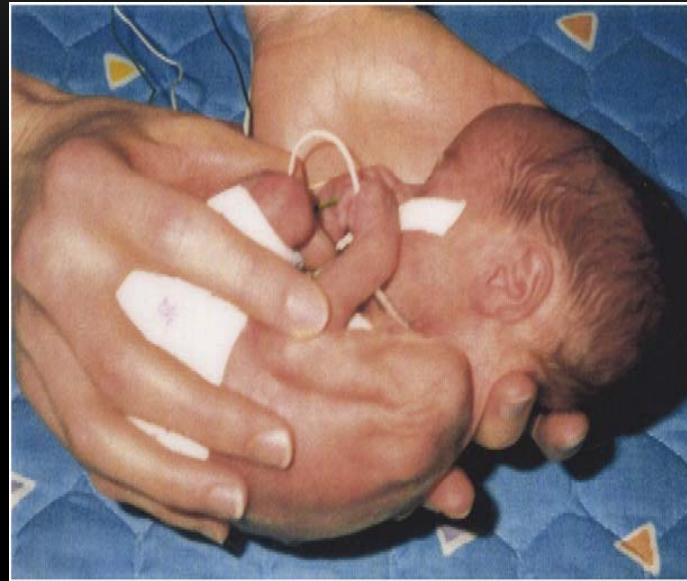
RECOMENDATION

Committee... (2007)	1-60 FC / 10-600 lux
Procedures	200 FC / 2000 lux



NEURODEVELOPMENTAL INTERVENTIONS

FLEXED MIDLINE POSITION



NEURODEVELOPMENTAL INTERVENTIONS

FLEXED MIDLINE POSITION



- Observational study
- videotaped 15 PT – 32 weeks GA
- Compared: prone nested vs. prone un-nested vs. side-lying nested vs. side-lying un-nested vs. supine nested vs. supine un-nested
- More stress behaviors (eg. startles, leg extension, yawning) and self-regulation observed in side-lying un-nested
- Less stress behaviors observed in prone nested, prone un-nested, or side-lying nested

NEURODEVELOPMENTAL INTERVENTIONS

TOUCH (Smith, 2012)

- Review 11 studies, PT < 30 weeks GA, NICU level III
- Type, duration (3-20min), freq (1-4/days), 3 days – hosp, pressure
 - **Massage** (n=2) + Kangaroo care
 - 15 min, 3x/day until discharge
 - Shorter hospitalization, better cognition (BS-MDI) at 2 years
 - **Gentle human touch** (still, or contained, gentle touch without stroking, rubbing, or passive movement) (n=5)
 - higher hematocrit levels, fewer blood transfusions, lower oxygen requirement over time
 - fewer startle responses, decreased overall activity with observable quieting

NEURODEVELOPMENTAL INTERVENTIONS

TOUCH

- **TAC-TIC** (Touch and Caressing-tender in caring) (n=2)
- gentle/light systematic and rhythmic stroking that follows a head to toe pattern (3-4 min, 2x/day).
 - ↓ HR, ↑ RR, no alteration SO₂
- **Social stimulation** (soothing voice) with or without stroking (80s) (n=1)
 - no alteration in HR
 - aversive behaviors in PT with higher severity of illness
- **Therapeutic Touch** (nonphysical touch) (n=1)
 - Greater HRV, No adverse effects

NEURODEVELOPMENTAL INTERVENTIONS



TOUCH

- Author's recommendations: (Smith, 2012)
 - Need specific recommendations on the type of very PT infants who would most likely benefit from comforting touch, specifically in relation to each infant's age and levels of morbidity.
 - Thoughtful administration of the type (quality), the timing, and the amount (quantity) of comforting touch should be considered and should not be administered on the basis of a timed interval but rather contingent on infant cues
 - Very PT infants in an active or distress state will likely benefit more than infants who are resting quietly and should otherwise not be disturbed

NEURODEVELOPMENTAL INTERVENTIONS

NON-NUTRITIVE SUCKLING

- Systematic review 21 studies (15 RCTs) (Pinelli; Symington, 2006)
 - ↓ hospitalization duration and ↓ transition time from tube to oral feeding
 - Divergent results: weight gain, HR, SO₂, intestinal transit time, age at 1st oral feeding, behavioral state
 - No adverse effect
- 120 PT: NNS (5-8min, 5-7x/day) + oral stimulation (1x/day) 30 min before feeding vs. with each intervention alone vs. control
 - reduced transition time from introduction to independent oral feeding and enhanced the milk transfer rate

(Zhang et al., 2014)

NEURODEVELOPMENTAL INTERVENTIONS

NON-NUTRITIVE SUCKLING

- No association between pacifier and EBF duration (Maastrup et al., 2014)
- Pacifier use should be limited during stablishment of BF
- **Pain relief (combined with sweet solutions)**

(Stevens et al., 2014)



NEURODEVELOPMENTAL INTERVENTIONS

PAIN MANAGEMENT



FACILITATED TUCKING

(CIGNACCO et al., 2010; AXELIN et al., 2009)



BREASTFEEDING

(SHAH et al. 2012; HOLSTI et al., 2011)

MEASUREMENT



KANGAROO POSITION

(JOHNSTON et al. 2014; WARNOCK et al., 2010)

PAIN TREATMENT

DOCUMENTATION

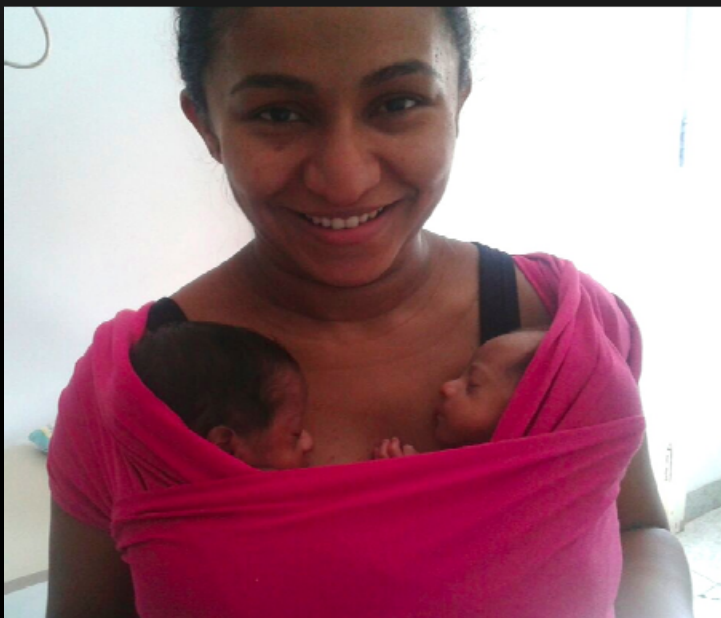


NNS + SWEET SOLUTIONS

(STEVENS; YAMADA; OHLSSON, 2013)

NEURODEVELOPMENTAL INTERVENTIONS

KANGAROO CARE



NEURODEVELOPMENTAL INTERVENTIONS

KANGAROO CARE

Advantages

(Boundy et al, 2016; Bayley et al., 2015)

- lower mortality and morbidity
- ↓ risk of sepsis, hypothermia, hypoglycemia
- ↓ hospital readmission
- ↑ EBF
- ↑ infant growth
- ↑ mother-infant attachment
- strengthens the family role
- decreases feelings of helplessness
- ↓ pain (3-15min before and during)

(CASTRAL et al., 2008)



TWO COHORT STUDIES

- higher scores on the BSID at 6 or 12 months of age

N=117 follow up at 10 years

- attenuated stress response,
- improved autonomic functioning, better-organized sleep, and better cognitive control

FAMILY CENTERED CARE

- Main characteristic: attitude that parents are the most important persons in their infant's life and act as the infant's primary caregivers
- Core concepts: dignity and respect, information sharing, participation, and collaboration
- Attitudes:
 - Encourage 24hs/7-days week presence of the family, including rounds
 - The ward transfers the infant's care gradually to the parents, commencing as soon as possible after birth, with support by professionals.
 - The ward provides practical possibilities, such as a place to rest and eat, for mothers/parents to be able to stay with their baby as long as they want
 - The ward provides individualized developmentally supportive surroundings that are appropriate for the infant and the parents.

(Nyqvist et al., 2012)

FAMILY CENTERED CARE

Participate in
infant's care

Group activities



Mother-
baby diary



FAMILY CENTERED CARE



Festive dates



Educational materials



NEONATAL INDIVIDUALIZED DEVELOPMENTAL CARE AND ASSESSMENT PROGRAM (NIDCAP)

Benefits:

- ↓ mechanical ventilation duration (-39.4 days)
- ↓ tube feeding duration (-32 days)
- ↓ hospitalization duration (-2.19 days IC)
- > Bayley Developmental score (up to 1 year)

(Symington ; Pinelli, 2002 ; Aucott et al., 2002; VandenBerg, 2007)

DOES NIDCAP COMPARED WITH STANDARD CARE IMPROVE NEURODEVELOPMENTAL AND MEDICAL OUTCOMES IN PRETERM INFANTS?

(Ohlsson; Jacobs, 2013)

- Systematic review and meta analyses (11 RCT, n=627)
- NIDCAP (Als) vs. traditional care, 2009-2012

In long term there was NO difference in:

- death or major sensorineural disability at 18 months CA or later in childhood
 - survival free of disability at 18 months CA or later in childhood
 - visual impairment, sensorineural hearing loss, or cerebral palsy at 18 months CA or later in childhood
- BSID-MDI (mental index) and BSID-PDI (psychomotor) scores were significantly higher at 9 or 12 months, but not at 4 months**

DOES NIDCAP COMPARED WITH STANDARD CARE IMPROVE NEURODEVELOPMENTAL AND MEDICAL OUTCOMES IN PRETERM INFANTS?

(Ohlsson; Jacobs, 2013)

In short term, there was NO difference in:

- hospital deaths, chronic lung disease at 36 weeks PMA, NEC, IVH, ROP, nosocomial sepsis, length of hospitalization, PMA at discharge, days on assisted ventilation via an endotracheal tube, sleep

THERE WAS a significant difference in:

- Length of hospitalization (- 6 days) and CA (- 0.5 week) at discharge
- Daily weight gain at hospital (↑ 1.5g)
- ~~APIB and Prechtl scores at 2 weeks CA~~

DOES NIDCAP COMPARED WITH STANDARD CARE IMPROVE NEURODEVELOPMENTAL AND MEDICAL OUTCOMES IN PRETERM INFANTS??

(Ohlsson; Jacobs, 2013)

- *Do not recommend the implementation of NIDCAP in its present form as standard care in preterm infants*
 - NIDCAP is resource-consuming, labor-intensive, and expensive both to implement and maintain,
 - Innovative interventions to promote development in preterm infants should be tested in large well designed RCTs and their results published in a timely fashion
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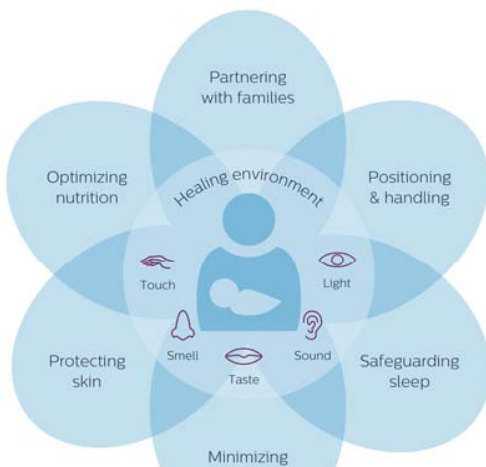
CRITIQUES TO THE REVIEW

- 21 letters to the editor (neonatologists, nurses, occupational therapist, psychologist, Heidelise Als, parents)
- 2 studies had appropriated sized sample
- did not included studies that examined EEG and MRI
- confusion with terms (NIDCAP vs. APIB)
- challenge to measure the effectiveness of NIDCAP becuase it is composed by several interventions and behavioral changes
- the aim of NIDCAP is to prevent overstimulation and pain, promote self competency. Aspects such as development of sensorial and autonomic systems, regulation, attention, parents-infant interaction were not considered

- Authors from the review give less attention to significant results

TAKE HOME MESSAGES

- Careful observation of infant cues and environment management can help to reduce infant stress, promote stability and self-competency for optimal development.
- Need large and well designed RCTs to strength and expand current evidences



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