Kliiniline küsimus nr 28

Kas perekeskne neonataalne ravi võrreldes selle mittekasutamisega parandab enneaegsete vastsündinute ravitulemusi ja perede psühhosotsiaalset toimetulekut ning kiindumussuhte tekkimist lapsega vs mitte?

- sünnijärgne nahk-naha kontakt koos nCPAP ravi alustamisega
- nahk-naha kontakt vaginaalse sünnituse ja keisrilõike korral (kestus)
- känguruhooldus
- NIDCAP
- perepalat
- analüüside ja uuringute sagedus, ajastamine ning valutustamine

Tulemusnäitajad: lapse peamised tulemusnäitajad, mõju pere psühhosotsiaalsele toimetulekule (vanemate ja/või õdede-vendade stress) ja lähedussuhtele lapsega

Ravijuhendid

Kokkuvõte ravijuhendis leiduvast

Care of extremely premature infants A guideline for the care of children born before 28 full weeks of pregnancy have passed. The Swedish National Board of Helth and Welfare. Published www.socialstyrelsen.se,September **2014**

Rootsi ravijuhendis esitatud soovitused käsitlevad erakordselt väikese gestatsioonivanusega (enne 28. rasedusnädalat sündinud) enneaegsete vastsündinute eest hoolitsemist ja ravi, samuti soovitusi paremaks neonataalse abi korraldamiseks. Tegemis hea kvaliteediga ravijuhendiga.

Rootsi ravijuhendis esitatud soovitused põhinevad 2014. aastani publitseeritud teaduskirjandusel ja Rootsi rahvuslikust kvaliteediregistrist ja rahvuslikust EXPRESS uuringust saadud andmetel (s.o. uuring erakordselt väikese gestatsioonivanusega enneaegsete kohta, koos järelkontrolliga, uuringus oli 1011 last, kes olid sündinud enne 27. rasedusnädalat, aastatel 2004-2007, Rootsis).

Rootsi riikliku tervise- ja heaoluameti hinnang/ The Swedish National Board of Health and Welfare's assessment

Lapse stabilisatsioon vahetult peale sündi

• lapsel peab olema võimalus olla oma vanemate lähedal enne, kui ta viiakse neonatoloogia osakonda.

The assessment is based on systematic charting, WHO recommendations, guidelines from a European consensus panel of neonatologists and consensus between the chairpersons of the expert groups.

Last tuleks alati stabiliseerida vanemate lähedal. Kui on võimalik, siis peale lapse seisundi stabiliseerimist, lubada emal last kallistada lühikese aja jooksul, tagades vajadusel hingamisabi. Sõltuvalt kohalikest oludest, lapsevanem võiks aidata last kaaluda, panna kuvööosi, võiks lapse viimisel neonatoloogia osakonda kaasas olla.

Valu

Valul võivad olla negatiivsed lühi- ja pikaajalised tagajärjed sensitiivses närvisüsteemi kiire kasvu- ja differentseerumiseperioodis ebaküpsele enneaegsele lapsele. Valulikke protseduure tuleks püüda minimeerida ja valu ravida. Kaasaegne neonataalne valu ravi on

balansseeritud, mitmepalgeline strateegia: vajalik on regulaarne valu hindamine, individuaalse käitumise toetamine (mittefarmakoloogiline ravi) ja vajadusel farmakoloogiline ravi.

Valu hindamine

• Valu diagnostikaks peaks valu hindama valideeritud instrumentidega (mis on kohandatud vastavalt lapse vanusele, küpsusastmele ja valu tüübile) nii suures ulatuses, kui võimlik.

The assessment is based on Swedish guidelines from the Swedish Child Pain Society and guidelines drawn up by an international consensus group.

Rahvusvahelised ja riiklikud ravijuhendid soovitavad, et kõik vastsündinutega tegelevad osakonnad, peavad omama toimimisviise, mis sisaldavad struktureeritud valu hindamise mudelit. See mudel on fundamentaalne objektiivse valu hindamiseks, vajalik adekvaatse ja ohutu ravi tegemiseks. Kasutatakse erinevaid vaatlusskaalasid. Lisa 2 näitab valu hinnangu instrumente, mida sageli kasutatakse ja soovitatakse kaasaegses neonataalses abis.

Appendix 2. Examples of pain assessment instruments

Pain assessment instrument		Reference	Dimensions	Emphasis	Validated for gestational age
ALPS-Neo	Astrid Lindgren and Lund children's hospitals pain and stress assessment scale for preterm and sick newborn infants	[185]	Behaviour: facial expression, level of consciousness, activity and tone in extremities. Physiological: breathing	Continuous	< 42 weeks, cared for at a neonatal unit directly after the birth
ALPS 1	Astrid Lindgren children's hospital pain assessment scale for term neonates		Behaviour: facial expression, level of consciousness, activity and tone in extremities Physiological: breathing	Continuous	Full-term until one month old
BIIP	Behavioural Indicators of Infant Pain	[186]	Behaviour: facial expression, hand activity, sleep	Procedure	23-32 weeks
COMFORT-neo		[187]	Behaviour: facial expression, level of consciousness, movement and tone in extremities, crying	Continuous	24-43 weeks
EDIN	E'chelle Douleur Inconfort Nouveaune	[188]	Behaviour: facial expression, body movements, quality of sleep, contact, consolability	Continuous	34-37 weeks
NFCS	Neonatal Facial Coding System	[189, 190]	Behaviour: facial expression	Procedure and Continuous	
NIPS	Newborn Infant Pain Scale	[191]	Behaviour: facial expression, breathing patterns, extremity movements, level of consciousness, crying	Procedure	
N-PASS	Neonatal Pain, Agitation, and Sedation Scale	[192]	Behaviour: crying, level of consciousness, facial expression, extremity tone Physiological: heart rate, breathing rate, blood pressure, oxygen saturation	Procedure and Continuous	23-40 weeks
PIPP PIPP-R	Premature Infant Pain Profile-Premature Infant Pain Profile-Revised	[193] [194]	Behaviour: facial expression Physiological: heart rate, oxygen saturation Context: gestational age, level of consciousness	Procedure	24-48 weeks

Mittefarmakoloogiline valuravi

• Valulike vahelesegamiste arv tuleb minimeerida

• Erakordselt väikese gestatsioonivanusega enneaegsetele tuleks alati tagada mittefarmakoloogiline, individualiseeritud hoolitsus valu ja stressi vähendamiseks, mis võib sisaldada järgnevat:

o läbimõeldud ja optimeeritud ümbritsev keskkond, näiteks vaikus (minimiseerida häirivad visuaalsed ja auditoorsed mõjud, vähendada otsest tugevat valgust);

o vanemate osalemine;

o hoolduses nahk-naha kontakti ja toetava koosolemise kasutamine;

o kindlustama, et laps oleks enne protseduure söönud, kuiv ja soe;

o lapsel peaks olema mugav asend;

o lapsel peaks olema võimalus midagi imeda (lutt, käsi või sõrm – enda või lapsevanema oma).

The assessment is based on Swedish guidelines from the Swedish Child Pain Society and guidelines drawn up by an international consensus group.

Farmakoloogiline valuravi

• Igal osakonnal peaks olema hästi korraldatud ja teada protseduurid, millal ja millist farmakoloogilist valuravi kasutada, mis sobivad ka akuutsetes situatsioonides.

• Situatsioonid, kus protseduurid peaks valutustama:

o protseduuri valu, k.a. intubatsioon

o postnataalne ja postoperatiive valu

o pideva valu ja stressi ravi respiraatorravi-, operatsiooniaegse valu korral

• Farmakoloogilist ravi peaks andma sobival ajal enne valulikku protseduuri ja alati toetama mittefarmakoloogiliste võtetega.

• *The assessment is based on Swedish guidelines from Swedish Child Pain Society and guidelines drawn up by an international consensus group.*

• Nõrk ja keskmine valu; suukaudselt anda vastsündinutele valuvaigistava toimega magusaid lahuseid (kontsentreeritud glükoos või sahharoos) (Stevens et al 2013).

HOOLDAMINE

Kõrge kvaliteediga põetamine peaks olema individualiseeritud, toetama arengut ja olema perekeskne.

Hoolitsus/ravi erakordselt väikese enneaegse eest peaks olema patsiendi ja perekeskne:

o individualiseeritud

o arengut toetav

o perele hoolitsuse pakkumine

o integreeritud ravi pakkumine

o aktiivne vanemate kaasamine ja informeerimine.

The assessment is based on systematic charting and consensus between the chairpersons of the expert groups.

Patsiendi ja perekesksus tähendab, et hoolitsus ja ravi ei ole limiteeritud ning ainult haigusele orienteeritud, vaid laiendatud, katmaks lapse, vanemate ja õdede-vendade teisi vajadusi.

Patsiendi- ja perekeskne ravi hõlmab järgmist:

• Perele hoolitsuse pakkumine s.t. vanemaid ja lapsi ei lahutata/eraldata, vanematele peaks pakutama võimalust jääda vastsündinute osakonda ka ööseks.

- Emasid, kellel endal on meditsiinilised vajadused, peaks niipalju kui võimalik integreerima vastsündinu eest hoolitsemisse vastsündinute osakonnas.
- Perekonna individuaalseid vajadusi peaks respekteerima niipalju kui võimalik.
- Vanemate tunnetega peaks arvestama ja neid märkama. Vanematele peaks pakutama psühhosotsiaalset tuge, lähedussuhte toetamist lapsega, mis sisaldab ka lapse eest põetamise toetamist.
- Vanemaid peaks julgustama võtma enda peale vastutus lapse eest hoolitsemisel. Lapse arengut soodustab, kui vanem veedab lapse juures võimalikult palju aega ning osaleb varakult ettevõtmistes, mis on fokusseeritud vanemate ja lapse omavahelistesse suhetesse, koostoimesse.
- Kogu informatsiooni lapse kohta jagatakse vanemaga, kui ei ole juriidilisi takistusi teabe avalikustamiseks.
- Hõlbustama koostööd vanemate ja personali vahel.

Patsiendi ja perekesksus on võti edukakas kiindumuseks ja analüütiliseks protsessiks ema ja lapse vahel. Analüütiline protsess on otsustav aju arengus ja lapse võimes stressiga toime tulla, mis omakorda mõjutab lapse üldist arengut ja tervist tulevikus.

Arengut-toetav hooldus

Arengut toetav ravi baseerub osaliselt meditsiinilisel ravil, aga ka sotsioloogilisel- ja käitumisteadusel. See baseerub kompetentsil aru saada lapse käitumisest, et toetada lapse autoregulatsiooni (närvisüsteemi, erksust, koostoimimist ümbritsevaga), samuti on kasu vanematele ja hooldavale personalile koostoimimisest lapsega.

Enneaegsele vastsündinule peaks pakkuma individuaalselt kohandatud, arengut toetavat ravi/hoolitsust, millel on positiivsed lühiaegsed toimed, suurendab lapse heaolu neonataalses perioodis, isegi kui pikaaegsetel mõjudel on nõrgem teaduslik tugi.

Erinevad sekkumisprogrammid, mida võib kasutada väga väikeste enneaegste laste eest hoolitsemisel, näiteks:

NIDCAP - (newborn individualised developmental care and assessment programme) vastsündinu individualiseeritud arenguline ravi/hoolitsus ja hindamisprogramm, mida rakendatakse kogu hoolitsusperioodi ajal, mille läbiviimist alustatakse peale sündi, mis on oluline neurobioloogilise arengu perspektiivis [NIDCAP Federation International, 2014]. Põhiliseks on lapse reageerimisvõime ja stiimulitega toime tuleku võimekuse individuaalne hindamine ja selle toetamine. Lisaks on oluline tähelepanu pöörata lapse asendile, kohanemisele ümbritseva keskkonnaga ja spetsiifiliste hooldusvõtete läbiviimise ajastatusele.

NIDCAP rakendamisel on mõned teaduslikud kinnitused positiivsetest lühiaegsetest toimetest tõsisele bronhopulmonaalsele düsplaasiale, nekrootilise enterokoliidi esinemissageduse vähenemisele ja perekondade olukorra parandamisele. Uuringud näitasid ka positiivseid kaugtoimeid lapse käitumisele ja motoorsetele oskustele [Symington et al. Cochrane Database Syst Rev 2006, Wallin et al. 2009]. Teiste uuringute järgi NIDCAP-l on positiivne mõju aju küpsusele ja kognitiivsele arengule [Als et al. 2012, Als et al. 2004] ning lühemale hoolitsus ajale [Peters et al. 2009].

Modifitseeritud NIDCAP, sama eesmärk, aga ei sisalda kõiki vaatluselemente, sama teoreetiline baas: **MITP (mother infant transaction programme)** ja **IBAIP (infant behavioural assessment and intervention programme).** MITP vähendab vanemate

stressitaset lapse esimesel eluaastal, on kasulik toime lapse kognitiivsele arengule 5.a.v. [Kaaresen et al. 2008, Olafsen et al. 2008]. IBAIP parandab lapse motoorset arengut, eriti sünnikaaluga alla 1500g, 5.a. järelkontrollil oli neil lastel parem kognitsioon (tulemuslikkuse IQ), samuti võime koordineerida visuaalseid muljeid ja liigutuste mustreid (visual-motor integration) [Koldewijn et al. 2013, Van Hus et al 2013].

Sageli kasutatakse nahk-naha kontakti meetodit 24 tundi päevas e. känguruhooldust (KH). Meetod baseerub otsesel nahakontaktil vanemaga või lähedase pereliikmega. **Teaduslik toetus selle meetodi positiivsetele toimetel on sagedamini uuritud madala sissetulekuga maades** [Conde-Agudelo et al. Cochrane Database Syst Rev 2011, Moore et al. Cochrane Database Syst Rev 2012, Nyqvist et al. 2010]. **Uuringutega on leitud, et NNK meetodit e. KH kasutamisel esineb madalam suremus, vähem tõsiseid infektsioone, parem temperatuuri regulatsioon ja lühemad raviajad vastsündinutel. Meetod on ka valu leevendava toimega** [Cochrane Database Syst Rev, Ridell et al. 2011, Akcan et al. 2009, Cignacco et al. 2007] **ja positiivse toimega lapse kasvule, ema rahulolule ja kiindumussuhtele lapsega haiglast väljakirjutamisel** [Kramer et al. 2008], **emal on parem piima produktsioon ja lapse eest hoolitsemise käitumine** [Renfrew et al. 2010]. **Pikemal imetamisperioodil on ka positiivne toime lapse kognitiivsele arengule** [Kramer et al, 2008].

Süstemaatilised ülevaated

Kokkuvõte süstemaatilistest ülevaadetest, randomiseeritud uuringutest, prospektiivsetest uuringutest

Nahk-naha kontakt (NNK), känguruhooldus (KH), perekeskne ravi

-Perekeskse neonataalse ravi kohta, mis parandab enneaegsete vastsündinute ravitulemusi ja perede psühhosotsiaalset toimetulekut ning kiindumussuhte tekkimist lapsega, oli vastavalt otsingukriteerimitele kättesaadavad **1 ülevaate artikkel 2015a**., **7 süstemaatilist ülevaadet/metaanalüüsi** (avaldatud viimase 5 aasta jooksul – (2014, 2014a,b, 2014, 2012, 2010, 2010, 2012), lisaks **2 randomiseeritud uuringut** (2006, 2014), **2 prospektiivset vaatlusuuringut** (2010, 2013), **1 soovitustega artikkel** känguruhoolduse kohta (2010) I Euroopa konverentsilt ja VII Rahvusvaheliselt Töötoalt.

- **NIDCAP – 1 süstemaatiline ülevaade/meta-analüüs** aastast 2013,

-perekeskse ravi kohta intensiivravi osakonnas **2 RCT uuringut** 2013, 2015

-perepalat - 1 prospektiivne kõrge kvaliteediga quasi-eksperimentaalne kohort uuring 2014.a.

-Valu, protseduuride, valutustamise kohta avaldatud viimase 5 aasta jooksul **süstemaatilisi ülevaateid 5 -** (2011, 2012, 2013, 2013, 2014), **4 RCT uuringut** (2012, 2012, 2013, 2015).

Perekonna kaasamine on võtmeks realiseerida potentsiaal kauakestvateks positiivseteks mõjudeks kõikide vastsündinute füüsilisele, kognitiivsele ja psühhosotsiaalsele arengule, k.a. nendele, kes on ravil neonataalses intensiivravi osakonnas (NICU). Perekeskne arenguline ravi (ingl.k. family-centered developmental care (FCDC)) tunnustab perekonda, kui NICU meeskonna olulist liiget. Perekonnad on integreeritud otustamisprotsessidesse ja on kaastöötajad lapse eest hoolitsemisel. Perekeskse arengulise ravi standardiseeritud põhimõtete kasutamisega NICU-s luuakse tugev ja toetav alus, suurendamaks perekonna eluaegset suhet oma lapsega ning tagatakse lapse optimaalne füüsiline, kognitiivne ja psühhosotsiaalne areng. Tehtud	**1. Review article Recommendations for involving the family in develop-mental care of the NICU baby** Craig JW, Glick C, Phillips R, Hall SL, Smith J, Browne J Journal of

on spetsiaalsed soovitused, mis toetavad vanemate kui oma lapse eest hoolitsejate rolli NICU-s. Soovitused toetavad ka NICU personali osalemist perekeskses arengulises ravis ja ühtlasi luuakse NICU strateegiad/eeskirjad/tegutsemisviisid, mis toetavad perekeskset ravi. Perekeskse ravi soovitused on tehtud kõikide laste põhivajadusi-, hospidaliseeritud laste erivajadusi arvestades ning arvestades ka perekondade vajadusi, kes peavad kriisiga toime tulema, kui laps on ravil intensiivravi osakonnas. Primaarne vajadus on minimiseerida püsiv negatiivne mõju, mis lapse haigusega võib vanema-lapse suhetele mõjuda. Ameerika Pediaatrite Akadeemia ja paljud teised organisatsioonid toetavad perekeskset ravi (2012). **Üks võimalus NICU meeskondadele on arendada ja laiendada perekeskse ravi praktikaid läbi kvaliteeti parandavate algatuste rakendamise, milledest peamised on: a) vanemate toetamine b) personali toetamine c) NICU tegutsemisviisid**. **1. Toetades vanemaid kui oma laste eest hooldajaid NICU-s** **-Lapse eraldamisel emast on tugev negatiivne mõju lapse füsioloogilisele stabiilsusele, samuti psühhosotsiaalsele heaolule ja aju arengule,** samas **enneaegse sünnituse mõju või haige vastsündinu hospitaliseerimine mõjutab oluliselt ka vanemaid ja peresid.** Omavaheline eraldamine on eriti tõsine väga väikese sünnikaaluga enneaegste (VLBW) ja nende perede puhul, kuna EA laps **veedab enamus ajast eemal oma vanematest ja neil on kõrge risk pikaaegseteks arengulisteks ja käitumisprobleemideks** (Craig jt. 2015, Singer jt. 2007). -Enneaegsete laste **vanematel on sageli puudus toetusest ja võimalustest tegeleda lapse kasvatamisega intensiivravi perioodil, mis põhjustab sageli väärarusaamu oma vastsündinu käitumuslikes märguannetes** (Melnyk jt. 2006) ja isegi märgistades oma lapsi, kui „raskeid“ (Cho jt., 2008). **-Vanemate eraldamine oma beebist NICU-s** (Mehler jt., 2011) **kombineerituna vaimse tervise küsimustega** nagu depression, post-traumaatiline stress, ängistus ja teised stressist põhjustatud seisundid **võivad kahjustada ebasoodsalt vanema-lapse suhet, millel on negatiivsed tagajärjed lapse sotsiaalsele ja emotsionaalsele arengule** (Ishizaki 2013, Huhtala, Korja jt. 2012), **käitumuslikele** (Pierrehumbert jt., 2003) **ja kognitiivsetele funktsioonidele** (Brecht, Shaw jt. 2012, Bernard-Bonnin 2004). **Eraldamine** võib muuta enneaegset last, eriti väga väikese sünnikaaluga vastsündinut, olles **riskiga kuritarvitamisele ja väärkohtlemisele, mis võib järgneda peale kojukirjutamist** (Huhtala, Korja jt. 2012, DiScala et al 2000, Hoffmann 2005). Haigete enneaegsete laste vanemad peavad arenema ja säilitama asjakohased arusaamised oma lapse vajadustest, et olla valmis koduseks lapse eest hoolitsemiseks (Craig 2015, Lee jt. 2012). **-Uuringutes** (O`Brieni jt. Kanadas, 2013, Ortenstrand jt. 2010a. Rootsis), **kus perekonnad olid täielikult integreeritud NICU meeskonda ja aktiivselt hoolitsesid oma lapse eest**, **näitasid positiivseid toimeid nii vanematele kui lastele. Emadel** esines	Perinatology **(2015)** 35, S5–S8;

vähem stressi ja **tundsid ennast rohkem teadlikemana ja enesekindlamana, lastel paranes kaaluiive ja väljakirjutamisel esines kõrgem ainult rinnagatoitmine** O`Brieni uuringus. **Haiglasoleku aeg oli lühem** Ortenstrandi uuringus. **Phillips jt. 2012a. leidsid, et toetades emasid NICU-s vastama oma lapse käitumisele, püüdes toetada kiindumussuhet, esines märkimisväärselt sagedamini rinnagatoitmist 8 nädalat pärast sündi.** **-Erinevad uuringud on näidanud seost vastsündinu stressi ja aju struktuuri muutuste vahel** (Smith jt., 2011). Smith jt. uuringute andmetel selgus et, kui vastsündinu oli NICU-s **avatud/kaitsmata suurenevale arvule stressoritele, esines lapse aju struktuuris ja funktsioonis regionaalne kahjustus,** mis tehti kindlaks magnetresonantstomograafias (MRI-s), samuti **esines ebanormaalsusi motoorses käitumises neuroloogilis-käitumuslikul läbivaatusel.** Kui vanematele näidata, kuidas ära tunda lapse käitumuslikke, sotsiaalseid ja füüsilisi märguandeid, siis vanemad toetavad lapse arengulist ja füüsilist edasiminekut, mis edaspidi kajastub muutustes aju struktuuris. -Milgrom jt. 2010 leidsid, et kui vanemad osalesid 10-sessioonilises koolitusprogrammis, kuidas vähendada nende EA laste stressirikkaid kogemusi, oli hiljem MRI uuringul nähtav nende laste ajude paranenud tserebraalne valgeaine mikrostruktuurne areng. -Scher jt. 2009a. uuringu andmetel, kus enneaegsed olid **emaga nahk-naha kontaktis 8 nädalat, esines lastel kiirem aju funktsiooni küpsemine hinnatuna elektroentsefalogrammiga, võõreldes lastega, kes ei saanud sellist kontakti.** -Milgromi jt. edasine uuring 2013a. hindas laiendatud vahelesegamise mõju kasutades täiustatud programmi (Mother-Infant Transaction Program, nim. PremieStart) beebidele ja emadele, kelle laps oli sündinud alla 30 rasedusnädala. Emad pidid selles treeningus ära tundma ja minimiseerima stressi vastuseid oma lastel. Osalenud emad oli enam sensitiivsed oma laste suhtes ja sobilikult tundlikud lapse stressi käitumisele. Nende lastel esines hiljem vähem stressikäitumist ajalise lapse- ja 6 kuu korrigeeritud vanuses. Tulemustest järeldus, et positiivne **vahelesegamine võib anda varast kasu kognitiivsele ja prelingvistilisele arengule.** -White-Traut jt. 2015a. näitasid, et kui emad said informatsiooni, kuidas anda oma beebidele lihtsaid, arengule vastavaid multisensoorseid stiimuleid programmi (“Hospital to Home Transition-Optimizing Premature Infant`s Environment program”) raames – siis nende lastel oli parem kaaluiive haiglasoleku ajal, olid vähem haiged 6-nädalat peale NICU-st koju kirjutamist. **<u>Kokkuvõtte:</u>** erinevad uuringud kindlustavad tugeva baasi erinevateks sekkumisteks, millel on potentsiaali vähendada keskkonna stressorite ebasoodasat mõju NICU-s olles, vähendavad võimalust halvaks arenguliseks tulemuseks lapsel, stressi vähendamine parandab vanemate vaimset tervist, mis omakorda võib parandada lapse ja vanema omavahelisi suhteid. **<u>Soovitused vanematele kui oma lapse eest hooldajate toetuseks</u>**	

A. Vanemaid peaks kaasama oluliste osalejatena partnerina lapse tervendamisel NICU ravi- ja hoolitsemis meeskonnas. a) Vanemad peaksid kasutama „hands-on“ e. „käed lapse küljes hoolitsust“, mis sisaldab varast, sagedast ja kauakestvat nahk-naha kontakti kui on meditsiiniliselt asjakohane, koos juhendamisega ja toetusega NICU personali poolt (Cleveland 2008)., b) osalema meditsiinilistel visiitidel, õendusabi aruannetel (AAP 2012, Voos jt., 2012), c) peaks olema ligipääes meditsiiniandmetele **B. Vanemaid ja pereliikmeid peaks toetama rakendama arenguliselt vastavat hoolitsust lastele, et nad oleksid kompetentsed hooldajad ja neuroprotektiivsed toetajad oma lastele** (Melnyk jt., 2006, Cho jt., 2008, Altimier jt., 2013) **s.t.:** a) andma mugavuse ja turvalisuse oma lapsele järjekindla kohalolekuga b) aru saama käitumuslikust kommunikatsioonist lapsega c) andma toetava asendi ja hooldamise beebile, s.t. toetavat suukaudset toitmise kogemust, nahk-naha kontakti, lapse puudutamist d) tegema koostööd NICU personaliga, et minimiseerida lapse stressi ja valu arenguliselt ootamatus NICU keskkonnas e) kaitsma lapse und, saades aru une tähtsusest tervenemisele, kasvamisele ja aju arengulse f) optimeerima lapse toitmist rinnapiimaga ja imetamisega igal võimalikul juhul g) kaitsma lapse nahka ja paljusid funktsioone **2. Personali osalemine perekeskses arengulises ravis** **Juhtkonna panustamine kogu tervishoiusüsteemi interdistsiplinaarsesse ravi/hoolitsemise mudelisse on oluline edukaks perekeskse arengulise ravi rakendamiseks,** k.a. administratsioon, arstide ja medõdede meeskond ja kogu haigla ülejäänud personal, kes annab toetust ja teenindab beebisid ja perekondi NICU-s. **Personali osalemine:** arvestada vanemate kultuurilis eripärasid, vajalikud on kirjalikud infomaterjalid vanematele. Kui vanemad saavad lapsega olla: õpetada käte hügieeni, personali rolle ja aparatuuri tööpõhimõtteid. Oluline on keskenduda lapse ja vanema suhtlemisele, rõhutades vanemate kohaloleku vajadust lühi- ja kaugtoimetele lapse arengus. Personalile õpetada perekeskse ravi printsiipe ja rakendamist. Personali suhtlemine vanemate ja peredega peaks olema regulaarne, arusaadav, personaalne, pidev. **3. NICU tegutsemisviisid toetamaks perekeskset arengulist ravi. NICU poliitika, tegutsemisviisid, protseduurid peavad toetama vanemate osalemist kui osa inetrdistsiplinaarsest meeskonnast.** Kasutades integreeritud, neuroprotektiivset, perekeskset arengulise ravi mudelit, spetsiaalse koolitusega vastsündinu terapeudid peavad tegema individualiseeritud raviprotseduure NICU-s (Barbosa 2013). Professionaalse koolitusega meeskonda vanema-lapse arenguliseks toetuseks peaks kuuluma spetsiaalselt treenitud õed, arstid, psühholoogid, koos vastsündinu terapeutidega s.t. tööterapeudid,	

füsioterapeudid ja kõnekeele patoloogid (Craig jt. 2015, Ludwig 2013, Sturdivant 2013, Barbosa 2013). **Soovitused:** a) vanemate ööpäevaringne ligipääs lapse juurde ning info kättesaadavus, b) töökorraldus soodustab vanemate osalemist tugisüsteemis, k.a. lapse õed-vennad, vanavanemad c) vanemate toetamise alustamine, kui on kahtlus lapse võimalikule ravile NICU-s (antenataalne konsultatsioon). d) tagada optimaalne peretoetus NICU-s: materiaalsed ressursid – näit. Peretuba, peresalong, magamistuba, pesemisruum, köök, jne., kus harjutada elamis/hoolitsemist enne kojuminekut, õppematerjalid; e) psühhosotsiaalne toetus iga professionaalse meeskonna liikme poolt f) vastastikune toetus erinevate laste vanemate vahel g) lapse surma korral interdistsiplinaarne toetus; h) kojuminekueelne ettevalmistus, jne.	
Sissejuhatus Känguruhooldus (KH) juurutati 1978a. Bogotas, Kolumbias, pediaatri Edgar Rey poolt. KH ema ja lapsega oli esialgselt mõeldud kasutada madala sissetulekuga maades inkubaatorite puuduse-, kõrge hospitaalinfektsioonide esinemissageduse ja lastest loobumise tõttu. KH kasutati alternatiivina konventsionaalsele väikese sünnikaaluga vastsündinute eest hoolitsemisele. **KMC- ingl.k. kangaroo mother care – känguruhooldust (KH) originaalis defineeritakse kui (1) <u>nahk-naha kontakti ema (NNK) ja vastsündinu vahel, mis on KH peamine komponent. Laps pannakse vertikaalasendis alasti (või mähkmega) ema rindkerele rindade vahele, ema riiete alla või kaetakse tekiga, rätikuga,jms. Kaks teist komponenti on</u> (2) sage imetamine ja ainult või valdavalt rinnaga toitmine ning (3) võimalusel varane koju kirjutamine haiglast järelkontrolliga**. NNK rakendatakse lapsele nii kaua kui ema ja laps seda taluvad. Ema võib NNK läbiviimist asendada teiste pereliikmetega, eriti lapse isaga. Maailmas on kasutusele võetud erinevad modifikatsioonid känguruhooldusest, näiteks: täielik rinnapiimaga või mitte täielik rinnapiimaga toitmine, rinnaga või sondiga toitmine, täielikult või osaliselt lapse alasti olek NNK olles, **pidev nahk-naha kontakt kestusega ≥20 tunni päevas**; **vahelduv nahk-naha kontakt –** <u>lühikesed episoodid 1 või paar korda päevas, päevade arv variaabelne, kestus erinev; varane koju kirjutamine või mitte.</u> **-2014a. hea kvaliteediga süstemaatilissee ülevaatesse/meta-analüüsi hõlmati 18 randomiseeritud kontrolluuringut, 2751 väikese sünnikaaluga last** (LBW<2500g, lapsed sõltumata gestatsioonivanusest). <u>16 uuringut hindas känguruhooldust–(KH) ingl.k. (KMC) LBW lastel peale stabiliseerimist</u> (Ali 2009; Blaymore Bier 1996; Boo 2007; Cattaneo 1998; Charpak 1997; Eka Pratiwi 2009; Gathwala 2008;Ghavane 2012; Kadam 2005;Neu 2010; Ramanathan 2001; Roberts 2000; Rojas 2003; Sloan 1994; Suman 2008; Whitelaw 1988), **1 hindas KH enne stabiliseerimist** (Worku 2005) ja 1 võrdles **varajast känguruhooldust (alustatud esimese 24 tunni jooksul peale sündi)** (Nagai 2010), **hilisema KH alustamisega (24**	**2. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants (Review)** Conde-Agudelo A, Díaz-Rossello JL **The Cochrane Database Syst Review 2014**

tundi peale sündi) suhteliselt stabiilsetel väikese sünnikaaluga enneaegsetel. 13 uuringut hindas **vahelduvat KH** (lühikesed episoodid 1 või paar korda päevas, päevade arv variaabelne) ja 5 **pidevat KH** (≥20 tunni päevas). **Väljakirjutamisel või 40-41.nädalal korrigeeritud vanuses, KH oli seotud suremuse riski** (RR 0.60, 95% CI 0.39 to 0.92; 8 uuringut, 1736 last), **nosokomiaalse infektsiooni/sepsise** (RR 0.45, 95% CI 0.27 to 0.76), **hüpotermia** (RR 0.34, 95% CI 0.17 to 0.67), **ja haiglasoleku aja** (tüüpiline keskmine erinevus 2.2 päeva, 95% CI 0.6 to 3.7) **vähenemisega**. **Hiliseimal järelkontrollil, KH oli seotud vähenenud nii suremuse riski** (RR 0.67, 95% CI 0.48 to 0.95; 11 uuringus, 2167 last) **kui ka tõsise infektsiooni /sepsise esinemisega** (RR 0.56, 95% CI 0.40 to 0.78). **Leiti, et KH suurendas mõningaid lapse kasvuparameetreid (kaal, pea ümbermõõt, pikkus), rinnaga toitmist ja ema-lapse kiindumust. Ei esinenud märkimisväärseid erinevusi KH laste ja kontrollgrupi laste vahel psühhomotoorses arengus ja neurosensoorses kahjustuses 1.a. vanuselt korrigeeritud vanuses. Tõendid sellest ülevaatest toetavad KH kasutamist väikese sünnikaaluga lastel alternatiivina konventsionaalsele neonataalsele hooldusele peamiselt piiratud ressurssidega seadmete korral. Edasine informatsioon on vajalik, mis puudutab ohutusse ja efektiivsusesse, pikaaegsetesse psühhomotoorse arengu tagajärgedesse, hoolduskuludesse varase pideva KH alustamisse ebastabiilsetel või suhteliselt stabiilsetel LBW lastel.** -**Soovitused praktikasse:** Kuigi käesolevad tõendid on peamiselt limiteeritud KH kasutamisega madala/keskmise sissetulekuga maades, on siiski uusi tõendeid, et **KH võib parandada rinnaga toitmise kestust kõrge sissetulekuga maades.** **Alagruppide analüüs soovitas mõlemat: pidevat ja vahelduvat känguruhooldust, mis mõlemad on kasulikud stabiilsetele LBW lastele. Kuna kontrollgrupp uuringutes, mis hindasid pidevat KH, olid inkubaatorites või soojenduslampide all, KH potentsiaalne kasulik toime haigestumisele ja suremusele LBW lastele peaks olema kõige suurem kohtades, kus konventsionaalne neonataalne abi ei ole kättesaadav. Tänaseni, varast pidevat KH mittestabiilsetele või suhteliselt stabiilsetele LBW lastele ei saa soovitada, mille tõendid baseeruvad 2-le väikesele uuringule.**	
I osa 2014. avaldatud kvalitatiivses süstemaatilises ülevaateartikklis, metauuringus, tehti metaandmete analüüs vanemate kogemuste kohta lapsega nahk-naha kontakti korral. 29 kvalitatiivses uuringus (avaldatud 2013a. detsembrini) oli käsitletud 401 ema ja 94 isa kogemusi, neist 18 uuringut enneaegsete lastega (k.a. VLBW, LBWI), 2 ajalistega ja 8 ei olnud gestatsioonivanus välja toodud. 2 teemat, mis seoses nahk-naha kontaktiga esile kerkisid – taastav kogemus ja energiat kulutav kogemus. **Tulemused - vanemate kogemused:** **Taastav kogemus vanematele:** head tunded (südantsoojendavad-,	**3.a Parental experiences of providing skin-to-skin care to their newborn infant*Part 1: A qualitative systematic review** Anderzen-Carlsson A, CaravalhoLampy Z, & Eriksson M.

emotsionaalseid kannatusi leevendavad-, rikastavad kogemused, õppimiskogemused, oma rolli leidmine, enesehinnagu paranemine, kontrolli saavutamine, toetava keskkonna loomine). Lapsevanema teadmine, et teeb head lapsele (s.o. tähtis lapsele, vanematel pereks saamise tunne, kiindumuse-, lähedussuhte teke lapsega). **Energiat kulutav kogemus:** ümbritsev keskkond takistuseks lapsega suhtlemisel, füüsiline ja emotsionaalne koormus, soovide ja nõudmiste lahknevus, ebakindlus, teistele haiget tegemise tunne oma lapse probleemidega. **See ülevaade lisas teaduslikku ja süstemaatilisi teadmisi vanemate kogemuste kohta NNK-i korral oma lapsega. Vajalikud on edaspidised uuringud isade kogemuste kohta. Tõenduspõhisest perspektiivist lähtudes süstemaatiline ülevaade näitas, et emad ja isad, kes teevad NNK-i lapsega, kogevad seda kui taastavat aga samas ka energiat kulutava kogemusena.**	Int J Qualitative Stud Health Well-being **2014**, 9: 24906 REVIEW ARTICLE
II osa 2014. avaldatud ülevaateartikklis, metauuringus, tehti kvalitatiivne metasüntees vanemate kogemuste kohta lapsega nahk-naha kontakti korral. 29 kvalitatiivses uuringus 9 riigist, oli käsitletud 401 ema ja 94 isa kogemusi, neist 18 uuringut enneaegsete lastega (k.a. VLBW, LBWI), 2 ajalistega ja 8 ei olnud gestatsioonivanus välja toodud. Interpreteerides ja sünteesides tulemusi ülevaates olevatest analüüsidest: tekkis teoreetiline mudel „*Becoming a parent under unfamiliar circumstances" – Lapsevanemaks saamine võõras olukorras*. Vanematele NNK-i pakkudes, tundub see olevat taastav, positiivne kogemus, kuid ka energiat kulutav kogemus. Toetav ümbritsev keskkond hõlbustab taastavat, positiivset kogemust, samal ajal kui takistused ümbritsevas keskkonnas teevad NNK-i läbiviimise energiat kulutavaks kogemuseks. NNK-i kogedes positiivse protsessina, soodustab see vanemate enesehinnangu kasvamist ja vanemad on valmis võtma täielikku vastutust oma lapse eest. Tulemused näitavad, et NNK-i saab interpreteerida mitte ainult kui perest-koosnevat ja tähtsat tervishoiualast sekkumist, vaid ka „tegelikult lapsevanemaks saamise protsessina". Protsess – „lapsevanemaks saamine" – spetsiifilises situatsioonis on mõjutatud väliste faktorite poolt 3 erineval tasandil: perekond ja sõbrad, kogukond ja ühiskond üldiselt. Vanemate kirjeldused NNK-i pakkumisest on sarnased sellele, mida varem on kirjeldatud kui loomulikku protsessi emaks või isaks saamisel. **Tervishoiutöötajad peaksid soodustama igati nahk-naha kontakti läbiviimist, kui planeeritakse uusi neonatoloogia osakondi, on oluline, et NNK-i lubatakse teha mõlemal vanemal, nii emal kui isal oma lapsega, luua selleks head tingimused: privaatsus, füüsiline komfort, toetav suhtumine - see kõik aitab kaasa eriolukorras lapsevanemaks saamisel.**	**3.b Parental experiences of providing skin-to-skin care to their newborn infant*Part 2: A qualitative meta-synthesis** Anderzen-Carlsson A, CaravalhoLampy Z, & Eriksson M. Int J Qualitative Stud Health Well-being 2014, 9: 24906 REVIEW ARTICLE
Känguruhooldus/Nahk-naha kontakt **Sissejuhatus** KH kasutatakse laialdaselt arenenud ja arengumaades vanematele ja nende väikese sünnikaaluga lastele, rakendatakse pidevat NNK-i ja	**4. Effects of Kangaroo Mother Care on maternal mood and interaction**

vahelduv NNK-i (Nyqvist et al., 2010). **Pidevat NNK-i kasutatakse tavaliselt arengumaades, kuid samuti ka mõnedes kõrgtehnoloogilistes intensiivraviosakondades** (Blomqvist & Nyqvist, 2010; Nyqvist et al., 2010). **Pidevat NNK-i rakendatakse ema ja lapse vahel alates sünnist, vähemalt 40 nädalani, ideaaljuhul imetamisega, haiglast väljakirjutamisega, kui laps on meditsiiniliselt stabiilne ja hoolika järelkontrolliga** (Cattaneo, Davanzo, Uxa, & Tamburlini, 1998; Nyqvist et al., 2010). **Vahelduvat NNK-i kasutatakse Läänemaades kiindumussuhte soodustamiseks vanema ja lapse vahel, NNK-i rakendatakse lühemate perioodidena päeva jooksul, erinevatel arvul päevadel** (Nyqvist et al., 2010). KH korral laps pannakse NNK-i emaga või isaga või hoolitsejaga, lapse pea on pööratud küljele, hingamisteed peavad olema vabad, et vältida hingamisteede obstruktsiooni (Nyqvist et al., 2010). Kehatemperatuuri säilitamiseks võib laps kanda mütsi, sokke või mähet ja pannakse hoolitseja riiete alla või kaetakse rätikuga (Cattaneo et al., 1998; Nyqvist et al., 2010). Elastse riidega võib siduda asendi säilitamiseks KH tegija külge. (Nyqvist et al., 2010). KH teostajale peaks pakkuma adekvaatset toetust ja informatsiooni, personalile õpetusi ja treeninguid KH kohta (Cattaneo et al., 1998; Nyqvist et al., 2010). Tervishoiuasutuses peaks olema protokollid ja juhised känguruhooldusest/nahk-naha kontaktist (Cattaneo et al., 1998; Nyqvist et al., 2010). **Känguruhoolduse positiivsed toimed:** positiivne toime lapse füsioloogilistele parameetritele, parem kognitiivne areng, infektsioonide esinemissageduse vähenemine, positiivne toime - unele, kisale, temperatuurile, kaaluiibele, südame ja hingamissagedusele, energia kulutamisele ja oksügenisatsioonile (Dodd, 2005; Hall, & Kirsten, 2008; Ludington-Hoe, 2011; Tessier, Cristo, Nadeau, & Schneider, 2011). Positiivsed psühholoogilised toimed lastele ja peredele, ema-lapse suhetele, ema meeleolule ja tunnetega toimetulekule (Charpak et al., 2005; Tallandini & Scalembra, 2006; Tessier et al., 2011). -**2014a. süstemaatilises ülevaates sünteesiti ja hinnati 13 randomiseeritud ja randomiseerimata kontrolluuringu teadus-tulemusi känguruhoolduse mõjudest vanema–enneaegse lapse suhtlemismustritele ja/või ema meeleolule.** Uuringutes enneaegsed ja LBW lapsed (terved või mitte) gestatsioonivanusega ≤37 nädala ja nende hooldajad (ema ja isa) – bioloogilised vanemad või mitte. Uuriti kas KH kasutamine vähendab kahjulikke psühholoogilisi mõjusid enneaegsest sünnitusest, leevendades ema negatiivset meeleolu ja/või edendades positiivsemaid koostoimeid enneaegse lapse ja vanemate vahel. **KH positiivsed tulemused esinesid 7 uuringus 9-st** (Ahn et al., 2010; Feldman et al., 2002; Feldman et al., 2003; Gathwala et al., 2008; Neu&Robinson, 2010; Tallandini & Scalembra, 2006; Tessier et al., 1998), **sisaldades rohkem positiivseid koostoimeid vanemate (enamus emad) ja nende enneaegsete laste vahel: rohkem puudutusi ja positiivset mõju, parem kohanemine lapse**	**patterns between parents and their preterm, low birth weight infants: A Systemic review** Athanasopoulou E., Fox JRE Infant Mental Health Journal, Vol.35(3), **2014**

käitumisega, tõusnud tundlikkus ja vähem piiravat käitumist. Eelised esinesid ka 6. kuu vanuselt (Feldman et al., 2002; Feldman et al., 2003; Neu&Robinson, 2010). **Samuti on võimalik, et KH aitab kaasa vanema-lapse lähedussuhte ja kiindumuse tekkeks**, kuna võimaldab vanemal rohkem aega veeta oma lapsega, vastupidiselt traditsioonilisele hooldusele, kui laps on inkubaatoris, vähendades varase lapse emast eraldamise negatiivset mõju. **5 uuringus KH rakendamisel esines ema emotsionaalse heaolu paranemine, mis väljendus vähema stressi ja depressiooni esinemisega, mis oli tingitud enneaegset sünnitusest, emadel esines suurem kompetentsustunne lapsega tegelusel** (De Macedo et al., 2007; Feldman et al., 2002; Lai et al., 2006; Tallandini & Scalembra, 2006; Tessier et al., 1998). **Vastupidiselt 4 uuringus ei leitud erinevusi KH ja kontrollgrupiga** (Ahn et al., 2010; Miles et al., 2006; Roberts et al., 2000; Whitelaw et al., 1988). Uuringud olid heterogeensed oma disaini, osalejate omaduste ja KMC rakendamise kestuse suhtes. **Uuringutest leiti tõendeid, et soovitada KH-st positiivsete toimete tõttu, kuid ei saa teha mingeid kindlaid järeldusi.** **Eelkõige leiti, et KH võib parandada negatiivset ema meeleolu (stressi ja depressiooni) ja soodustada positiivselt vanema-lapse omavahelist suhtlemist.**	
2012.a. süstemaatilises ülevaates analüüsiti 34 randomiseeritud kontrolluuringut, mis võrdlesid varast nahk-naha kontakti tavalise haigla hooldusega. Uuringusse hõlmati 2177 osalejat (ema-lapse paari) emad ja terved ajalised või enneaegsed lapsed (getstatsioonivanusega 34 kuni <37 nädala), **kes olid varases nahk-naha kontaktis, mis algas alla 24 tunni peale sündi** ja kontrollgrupp tavalise hooldusega. **Varase NNK-i alakategooriad ajalistele ja hilisenneaegstele:** **(a) NNK sünnil –** laps pannakse kõhuli asendis ema rindkerele või kõhule esimesel eluminutil. Laps kuivatatakse, pähe pannakse müts, kaetakse eelsoojendatud rätikuga. NNK kestab vähemalt esimese elutunni lõpuni või esimese eduka imetamiseni**.** **(b) Väga varane NNK –** umbes 30-40 minutil peale sündi, paljas laps pannakse kõhuli asendis ema rindkerele. **(c) Varane NNK –** algus ükskõik, mis ajal esimese 24 elutunni jooksul. Paljas laps, mähkmega või ilma ja mütsiga, pannakse kõhuli asendis ema rindkerele, rindade vahele. Emal avatud pluus või kittel või laps pannakse riiete alla. Kõige tähtsam, et ema ja laps oleks vahetus kontaktis ventraalselt, last hoitakse kuiva ja soojana. Uuringute üldine metodoloogiline kvaliteet oli segatud, esines kõrge heterogeensus mõnedes tulemustes. Metodoloogiliste piirangute tõttu uuringu üldine kvaliteet on keskmine. **Tulemused** **Esines statistiliselt märkimisväärne varase nahk-naha kontakti positiivne toime imetamisele 1-st kuni 4 kuu vanuseni** (13 uuringut; 702 osalejat) ((RR) 1.27, 95% (CI) 1.06 to 1.53, **ja NNK-i**	**5. Early skin-to-skin contact for mothers and their healthy newborn infants (Review)** Moore ER, Anderson GC, Bergman N, Dowswell T **The Cochrane Database Syst Review 2012**

korral pikem imetamisperiood (7 uuringuuts; 324 osalejat) ((MD) 42.55 päeva, 95% CI - 1.69 to 86.79) aga tulemused ei olnud statistiliselt päris märkimisväärsed (P = 0.06). **Hilisenneaegsetel lastel oli parem kardiorespiratoorne stabiilsus varase NNK-i korral** (üks uuring; 31 osalejat) (MD 2.88, 95% CI 0.53 to 5.23). **Veresuhkur 75 kuni 90 minutit peala sündi oli märkimisväärselt kõrgem NNK-i grupis** (2 uuringut, 94 last) (MD 10.56 mg/dL, 95% CI 8.40 to 12.72). **Kokkuvõte** Piirangud metodoloogilise kvaliteedi osas, varieeruvus rakendamisel ja tulemustes. **NNK-i rakendamine on kasulik rinnaga toitmise õnnestumisele, kestusele ja kardiorespiratoorsele stabiilsusele, vähendab vastsündinu kisa, ei ole negatiivseid lühi- ega kaugtagajärgi.** Soovitatavad edasised uuringud.	
2010a. metaanalüüsi eesmärgks oli uurida, kas NNK mõjutab vastsündinu kehatemperatuuri, südamesagedust ja hapniku saturatsiooni. **Tulemused** Metaanalüüsi hõlmati 23 uuringut (18 uuringut kõrge sissetulekuga maades), 15 uuringut enneaegsete (gestatsioonivanuses 26-36 nädalat, 326 last), 8 uuringut ajaliste vastsündinute (190 last) kohta. Metaanalüüsis esinesid tõendid kehatemperatuuri tõusust (weighted mean difference [WMD] 0.22°C, P< 0.001) ja hapniku saturatsiooni langusest (WMD -0.60%; P = 0.01) nahk-naha kontakti ajal, võrreldes enne nahk-naha kontakti. Keha temperatuuri tõus oli enam ilmne halva varustusega kohtades (WMD, 0.61°C, P<0.001) võrreldes hea varustusega kohtades (WMD 0.20°C, P< 0.001). Mõlemad, positiivne mõju keha temperatuurile ja negatiivne mõju saturatsioonile olid enam väljendunud külmas keskkonnas võrreldes soojema temperatuuriga keskkondades (WMD 0.18°C, P< 0.001; WMD -0.82%, P = 0.02). Metaanalüüsist järeldus, et kehatemperatuur tõusis 0.22°C, ei esinenud muutusi südamesageduses ja statistiliselt, mitte kliiniliselt, märkimisväärne saturatsiooni langus 0.60% NNK-i ajal. **<u>Soovitused kliinilisse praktikasse</u>** **Arvestades kõiki KH ja/või NNK-i mõjusid madalama sissetulekuga maades, siis NNK-i võib propageerida stabiilsetele madala sünnikaaluga ja normaalse sünnikaaluga vastsündinutele. Enneaegsed, kellel esineb enneaegse apnoe, ei tohiks rakendada NNK-i ilma adekvaatse saturatsiooni ja respiratoorse monitooringuta. Keskkonna mõju on oluline, sellele peab pöörama tähelepanu.** **NNK on efektiivne viis soojendada vastsündinuid, eriti kui ressursid on piiratud ja keskkond on suhteliselt külm. Adekvaatne saturatsiooni ja respiratoorse staatuse monitooring kogu hoolduse ajal on vajalik maades, kus sissetulek on suhteliselt kõrge.**	**6. Meta-analysis of physiological effects of skin-to-skin contact for newborns and mothers** **Mori R, Khanna R, Debbie P, Nakayama T** *Pediatrics International* **(2010)** 52, 161–170 doi: 10.1111
2010a. süstemaatilisesse ülevaatesse metaanalüüsiks oli hõlmatud 15 uuringut enneaegsete (sünnikaaluga <2000 g)	**7. 'Kangaroo mother care' to prevent**

suremuse ja/või haigestumise tulemuste kohta, 9 randomiseeritud uuringut ja 6 vaatlusuuringut keskmise või madala sissetulekuga maades. Uuringute kvaliteet hinnati keskmiseks või kõrgeks. Esimene publitseeritud metaanalüüs, kõrge tõenduspõhisusega, mis näitas, et esimesel elunädalal rakendatud känguruhooldus vähendas märkimisväärselt neonataalset suremust (3 RCT - RR 0.49, 95%, CI 0.29–0.82; 3 vaatlusuuringut RR 0.68, 95% CI 0.58–0.79)) enneaegsete (sünnikaaluga <2000 g) hulgas haiglas, võrreldes tavapärase hooldusega (inkubaator). Samuti esines märkimisväärne haigestumise vähenemine tõsistesse infektsioonidesse (5 RCT - RR 0.34, 95% CI 0.17–0.65) (sepsis, nekrootiline enterokoliit, raske pneumoonia). **KOKKUVÕTE:** **-Känguruhooldus vähendab oluliselt neonataalset suremust enneaegsete (sünnikaaluga <2000 g) hulgas haiglas ja on väga efektiivne tõsise haigetumise (eriti infektsioonidesse) vähendamisel.** **-Tõendid on piisavad, et soovitada rutiinselt KH-t kõikidele <2000g enneaegsetel niipea, kui nende seisund on stabiilne.**	**neonatal deaths due to preterm birth complications** **Systematic review/ metaanalysis** Lawn JL, Mwansa-Kambafwile J, Bernardo LH, Fernando CB, Cousens S International Journal of Epidemiology **2010**;39:i144–i154 doi:10.1093/ije/dyq031
2012a. esimene süstemaatiline ülevaade, kus uuriti enneaegse sünni mõju ema-lapse omavahelisele suhtlemisele ja kiindumussuhtele lapse 2 esimese eluaasta jooksul. Ülevaates oli 29 uuringut: 3 uuringut ema kiindumuse kohta, 18 uuringut ema-enneaegse lapse suhtlemise kohta ja 8 uuringut enneaegse lapse kiindumuse kohta, mis hinnati ka metaanalüüsiga. **Tulemused** Uuringud ema-enneaegse lapse suhtlemise kohta näitasid, et esinesid erinevused emade käitumises suhtlemisel enneaegse (emad rohkem kontrollivad, aktiivsemad, sirgjoonelisemad) ja ajalise lapsega, eriti 6.esimesel elukuul. Enneaegsete emad räägivad ja vaatavad rohkem oma last, võrreldes ajaliste laste emadega, aga samas nad puudutavad ja naeratavad vähem oma lapsele esimesel 3-l elukuul, vähem esineb näoga emotsioonide peegeldamist, imiteerimist. Erinevused enneaegse lapse suhtlemiskäitumises esinesid peale sündi 6.-l elukuul, lapse suhtlemisvõimes esines käitumuslik ja emotsionaalne defitsiit (näit. Lapsed passiivsemad, vähem aega ärkvelolekus, madalam tähelepanu kvaliteet, mängu ja motoorsed oskused, jne.) ja erinevused ema suhtlemisstiilides (5 uuringut 18.-st näitasid võrdset või isegi kõrgema kvaliteediga ema-lapse suhtlemist enneaegsete grupis võrreldes ajaliste laste grupiga). Uuringud ema ja lapse kiindumussuhte/lähedussuhte kohta näitasid, et enneaegsed lapsed ja nende emad ei ole kõrgema riskiga ebakindlaks/mitteturvaliseks kiindumuseks võrreldes ajaliste vastsündinute ja nende emadega. **Kokkuvõte, kliinilised järeldused** **-Ema ja enneaegse lapse suhe on keeruline ja mõned käitumismustrid prognoosivad suuremat psühholoogilist riski kui teised. Kliinilises kontekstis on oluline toetada lähedast ema-lapse kontakti, vähendada ema stressi ja varast ema-lapse eraldatust igal võimalikul viisil haiglasoleku ajal, samuti koju**	**8. The effects of preterm birth on mother–infant interaction and attachment during the infant's first two years** **Systematic Review** Korja R, Latva R & Lehtonen L. Acta Obstetricia et Gynecologica Scandinavica, **2012;** 91;164-173

kirjutamisel. **-Lapse vaimse tervise huvides, varased sekkumised, mis soodustavad enneaegse emotsionaalset ja sotsiaalset arengut peaksid olema tavapärases kasutuses.**	
2013a. prospektiivne vaatlusuuring enneaegsetel lastel (GV 24-33näd., 96 last, sünnikaal 510-1972g, postnataalne vanus 0-55p, keskmine nahk-naha kontakti kestus 71.39 (±34.36minutit, **17 last_intubeeritud, 49 nCPAP, 92 lapsel tsentraalne veeni kateeter) kinnitas, et nahk-naha kontakti rakendamine NICU-s on ohutu ja efektiivne isegi ventileeritud enneaegsetele lastele.** NNK-i ajal suurenes oluliselt hapniku saturatsioon hapniku vajaduse langusega, südamesageduse langusega stabiilsemaks, vererõhk ja transkutanne CO2 osarõhk eriti ei varieerunud, vähenes transitoorselt keskmine aksillaarne temperatuur. Apnoesid/bradükardiaid ei esinenud 122 NNK-i episoodil (87%), vähese vahelesegamise vajadus esines 19 korral (13%), mille korral NNK-i ei pidanud lõpetama. Need andmed võivad kaasa aidata varasemale ja pikemaaegsele nahk-naha kontakti kasutamisele, mis võib parandada NICU-s ravi vajavate laste neuroloogilist arengut. Registreerides füsioloogilisi andmeid enne, NNK ajal ja peale NNK-i, kindlustab andmed, mis on vajalikud NNK-i julgemaks ja kindlamaks kasutamiseks praktikas.	**9. Safety and Effectiveness of skin-to-skin Contact in the NICU to Support Neuro-development in Vulnerable Preterm Infants.** Carabasse A, Kracher S, Hausser M, Lnaglet C, Escande B, Donato L, Astruc D, Kuhn P. JPerinatol Neonat Nurs, **2013**; 27;3, 255-262
Kasutada originaalset känguruhooldus meetodit, koos pideva nahk-naha kontaktiga, ükskõik, kus see on võimalik, on soovitav rakendada kõrg-tehnoloogilises keskkonnas, kuigi teduslik hindamine peaks jätkuma. **Soovitused** **1. NNK alustamine:** -**pidev NNK sünnist;** erandid – lapse meditsiiniline seisund või vanemad ei ole kättesaadavad **- Gestatsioonivanus (GV) ≥32näd.:** lapse esmase seisundi hindamine sünnitustoas ema rindkerel, kui võimalik; **Kerged adaptatsiooniprobleemid sünnijärgselt:** kohe peale esmast stabilisatsiooni, kui lapse seisund ja hooldus võimaldab; **CPAP-ga laps:** peale stabilisatsiooni transport ema juurde NNK-ks koos monitoriga ja jälgimisega (CPAP/ventilaatorravi ei ole takistuseks NNK-le) -**GV 28-31näd.:** NNK kohe peale esmast seisundi hindamist/ stabilisatsiooni, kui lapse seisund ja hooldus võimaldab; **-GV <27näd.:** NNK esimesel elunädalal: baseerub individuaalsel meditsiinilisel hinnangul -**Keisrilõige:** NNK – laps panna lühikeseks ajaks ema rindkerele operatsioonitoas, võimalusel jätkata post-op jälgimisel. Kui ema on transporditud intensiivravi osakonda, rakendada NNK-i nii palju kui võimalik, ilma põhjendatud piiranguteta (isa või asendaja võib olla kui esmane hooldaja lapsele); **Kui ema ei saa intensiivravi osakonda peale sünnitust, lapse võib transportida ema juurde isaga nahk-naha kontaktis olles** (saadab intensiivravi personal kui monitooring on vajalik) või transport kuvöösis, saadab ja jälgib int.ravi personal), kui see on võimalik;	**10. State of the art and recommendations Kangaroo mother care: application in a high-tech environment.** Nyqvist KH, an Expert Group of the International Network on Kangaroo Mother Care: Anderson GC, Bergman N, Cattaneo A, Charpak N, Davanzo R, Ewald U, Ludington-Hoe S, Mendoza S, Pallás-Allonso C, Peláez JG, Sizun J, Widström A-M **COMMITTEE REPORT** **Acta Pædiatrica 2010 99, pp. 812–819**

• **Nahk-naha kontakti kestus - vähemalt 1 tund korraga.** **2. NNK transpordi ajal 3. Vanemate kohalolu ja rolli toetamine**	
2010a. Prospektiivne uuring, kus osales 22 erakordselt väikest (<28 rasedusnädala) kliiniliselt stabiilises seisundis enneaegset last, uuriti kas suudavad säilitada normotemia NNK-i ajal ja kas esines negatiivseid mõjusid. 10 lapsel oli nabakateeter, 8 perifeerne või perkutaanne veenitee, 1 mehhaanilisel ventilatsioonil, teistel nCPAP. 16 lapsel emaga NNK, 5-l isaga, 1-l vanema õega. **Kokkuvõte: Kliiniliselt stabiilised erakordselt väikesed enneaegsed GV <28 rasedusnädala suudavad säilitada adekvaatse nahatemperatuuri ja adekvaatse füüsilise stabiilsuse (hingamissagedus, südamesagedus või hapniku saturatsioon) nahk-naha kontakti ajal ja peale seda oma vanematega (ema, isa). Keskmine NNK-i kestus uuringus oli 98min.**	**11. Extremely preterm infants tolerate skin-to-skin contact during the first weeks of life** Maastrup R., Greisen G Acta Paediatrica **2010**;99;1145-1149
2014a. randomiseeritud kontrolluuring, kus osales 100 stabiilses seisundis last n=100, GV 34-40n., sünnikaal >1800g. Võrreldi varase nahk-naha kontaktigrupi lapsi (varane NNK I 24 tunni jooksul, alates 30min.- 1 tund peale sündi, soovitati teha miinimumajaga 60-minutiliste sessioonidega niipalju kui võimalik, järgmised 24 t konventsionaalne hooldus) ja konventsionaalse hooldusega (riietatud lapsed ema juures 48 tunni jooksul). Mõõdeti laste kehatemperatuuri ja südamesagedust. **Tulemused:** Mõlemas grupis 50 last. NNK grupis keskmiselt (s.d.) 16.98t (0.28) NNK-i kestus I 24t jooksul. Keskmine temperatuur märkimisväärselt kõrge NNK grupis igal mõõdetud ajal I 48 t jooksul (P<0.05 for all). NNK-i grupis ainult 2 lapsel kerge hüpotermia (4%) ja ühel neist 2 hüpotermia episoodi I 3 tunni jooksul. Relatiivne risk hüpotermia tekkeks kontrollgrupis võrreldes NNK-i grupiga oli 8.00 (95% CI 1.94–32.99). **Kokkuvõte: Vastsündinud nahk-naha kontakti grupis saavutasid kiire temperatuuri kontrolli võrreldes kontrollgrupiga. Varane NNK esimese 24 tunni jooksul peale sündi vähendab hüpotermiat esimese 48 elutunni jooksul.** **Varast nahk-naha kontakti peab agressiivselt soovitama hilisenneaegsetele ja ajalistele lastele.**	**12. Effect of early skin-to-skin contact following normal delivery on incidence of hypothermia in neonates more than 1800 g: randomized control trial** Nimbalkar SM, Patel VK, Patel DV, Nimbalkar AS, Sethi A, Phatak A Journal of Perinatology (**2014**)34, 364–368
2006a. randomiseeritud kontrolluuring neurofüsioloogiline neonataalse une organiseerituse hindamine elektoentsefalograafia/polüsomnograafiaga enneaegsetel lastel gestatsioonivanuses ≥28n, kaal >1000 g, (uuringusse võeti enne <32rasedusnädalat sündinud enneaegsed), 14 last NNK-i grupis, 14 kontrollgrupis. **NNK ema või isaga, näitas, et NNK-i võib kasutada enneaegsetele magamisel parema ja organiseerituma une saamiseks (esines märkimisväärselt vähem erutusi, vähem kiireid silmaliigutusi ja aktiivset und, vähem ebamäärast und, suurenes vaikse une periood – need on muudatused une organistasioonis, mis võivad soodustada aju küpsemist).** NNK-i ajal esines kardiorespiratoorne ja hapniku saturatsiooni stabiilsus. Lapsele on oluline ema südamelöökide kuulmine, ema rindkere rütmiline liikumine hingamisel üles-alla, ema puudutused – mis kõik	**13.Neurophysiologic Assessment of Neonatal Sleep Organization: Preliminary Results of a Randomized, Controlled Trial of Skin Contact With Preterm Infants** Susan M. Ludington-Hoe, , Mark WJ, Morgan K, Lewis T, Gutman J, Wilson, Mark SS,

rahustavad last. **See uuring näitab, et NNK on mittefarmakoloogiline sekkumine ravisse, mis mõjutab une organiseeritust.** **Vanemate kaasamine neonataalsesse intensiivraviosakonda vastsündinu eest hoolitsemisse on väga soovitatav, rohkem tuleks kaasta vanemaid. Kuna paranenud une kasulikud mõjud on olulised neuroloogilises (aju) arengus, mis on subtiilsed ja järkjärgulised, peab NNK-i postnataalselt praktiseerima rohkem, pikemate perioodidena.**	PED117,5,**2006**
2013a. süstemaatilisse ülevaatesse/metaanalüüsi oli kaasatud 11 randomiseeritud kontrolluuringut esmaste tulemuste kohta, ja 7 uuringut kaugtulemuste kohta (otsing 2012a. veebruarini), 627 vastsündinut. Uuringute kvaliteet varieerus, kuid 2 olid kõrge kvaliteediga. Uuriti NIDCAP efektiivsust meditsiinilistele ja neuroloogilise arengu kaugtulemustele, kas parandab tulemusi enneaegsetel lastel võrreldes standardhooldusega. **Süstemaatilises ülevaates, milles uuriti 627 enneaegset vastündinut, ei leitud ühtegi tõendit, et NIDCAP parandab neuroloogilisearengu kaugtulemusi või lühiajalisi meditsiinilisi tulemusi, ei saa soovitada NIDCAP praegusel kujul enneaegsete standardhooldusessse. NIDCAP-i on kulukas rakendada ja säilitada, vajab arenguspetsialiste, regulaarsust, abipersonali.**	**14. NIDCAP: A Systematic Review and Meta-analyses of Randomized Controlled Trials** Ohlsson A, Jacobs SE PEDIATRICs 131;3;**2013**
Sissejuhatus Enneaegsete laste elulemuse tõusuga seoses püsivad kõrged riskid pikaaegseteks negatiivseteks neuroloogise arengu- ja käitumishäireteks, nagu tähelepanu defitsiit [Johnson et al 2011], kognitiivsed häired [Peterson et al 2000, Baron et al 2012], depressioon ja psühhootilised häired [Nosarti et al 2012] ja autismi spektri häired [Pinto-Martin et al 2011]. **FNI - family nurture intervention - Perekesksed sekkumised/perepoolne lapse eest hoolitsemine/perekeskne ravi s.t.** stimuleerida ema ja tema enneaegse lapse vahelist sidet nii vara kui võimalik ning rakendada abikaasa ja teiste pereliikmete toetust. **Perekesksed sekkumised soodustavad tundmuslikku suhtlemist/lähedussidet, emotsionaalset sidet ema ja lapse vahel. Rakendatakse rahustavaid sessioone (calming sessions), kui laps on NICU-s ja kuvöösis, mis aktiveerivad ema ja last vastastikku füüsilistes, sensoorsetes ja emotsionaalsetes kogemustes. Nendeks on ema ja lapse lõhnaga vastastikune puuvillase riideeseme vahetus, pikemaaegne lapse puudutamine (üks käsi jalgadel, teine kõhul), häälega rahustamine, silmside kontakt. Hiljem, kui laps on stabiilne, rakendada NNK-i (vähemalt 4x nädalas), lisaks võimalikult palju kaasta ema igapäevasesse lapse hooldamisse.** **<u>Randomiseeritud kontrollitud ühekeskuseline, paralleelgruppidega uuring</u>, tõenduspõhiste perekesksete sekkumiste mõjust haiglasoleku ajale, rakedatavusest, ohutusest NICU-s.** Enneaegsete laste (GV 26-34n.) pered n=150 randomiseeriti 2 gruppi:, FNI=78, standardhooldus (standard care) SC=72. FNI grupis eriväljaõppega spetsialisti poolt soodustati ema-	**15. Randomized controlled trial of Family Nurture Intervention in the NICU: assessments of length of stay, feasibility and safety** Welch MG, Hofer MA, Stark RI, Andrews HF, Austin J, Glickstein SB, Ludwig RJ Myers MM and the FIN trial Group BMC Pediatrics **2013,** 13:148

lapse suhtlemist spetsiifiliste rahustavate tegelustega (rahustav puudutus ja lapsega rääkimine, NNK vähemalt 4x nädalas, lapse eest hoolitsemine – toitmine, mähkemete vahetamine, vannitamine). **Tulemused: Perekesksed sekkumised/tegelused/perekeskne ravi enneaegse lapse eest hoolitsemisel (GV 26-34n.) – <u>ei esinenud</u> märkimisväärset mõju esmastele lühiajalistele tagajärgedele, haiglasoleku ajale, s.t. positiivne toime, FNI võib rakendada ohutult ja on teostatav IV astme intensiivravi osakonnas.** **FNI ei tõstnud meditsiinilisi riske: ei tõusnud sepsise, nekrootilise enterokoliidi, krampide, retinopaatia esinemine, ei esinenud hapniku vajaduse tõusu, ravimite suurenenud vajadust. Suurenenud puudutuste ja lõhnavate riiete vahetamisega ei kaasnenud infektsioonide esinemissageduse tõusu.**	
Enneaegsetel lastel on kõrge risk ebasoodsateks neuroloogilise arengu ja käitumishäirete tekkeks. Perekeskne sekkumine/perekeskne ravi (FNI) – s.o. uus sekkumise viis, mis on loodud vastukaaluks ema-enneaegse lapse lahutamisest tingitud kahjulikele toimetele NICU-s. Soodustades emotsionaalset sidet ja taastades klassikalised adaptatiivsed rutiinsed tingimused ema-lapse vahel – nim. rahustavaks tsükliks (calming cycle), s.o. teatud kindlate rahustavate võtete kasutamine, ema ja enneaegse lapse vahelise sideme ja suhtlemise soodustamiseks (Welch jt. 1988, Welch, Hofer, Brunelli, Stark jt. 2012). Varasemalt perekesksest (FNI) sekkumistest on randomiseeritud kontrolluuringud läbi viidud aastatel 2008-2012 (Welch jt. 2013, 2014, 2015). **2015.a. randomiseeritud longitudinaalses järelkontrolli uuringus hinnati FNI toimet** – perekesksete lapse eest hoolitsemise võtete kasutamist NICU-s neuroloogilis-käitumuslikele tulemustele, korrigeeritud 18. kuu vanuses enneaegsetele lastele. 2 gruppi, FNI grupp=45, standard hooldus n=31. **FNI parandas märkimisväärselt Bayley-III testi tulemusi kognitiivse skooringu osas** (p = .039), (Bayley III test on valideeritud lapse arengu hindamine 1k.-42k. vanuses: kognitiivne areng, kõne areng, motoorika areng) ja **keeleoskuse skooringu osas** (p = .008) lastel, kelle skooring oli üle 85 (üle 85-100 on norm, ei esine arengus mahajäämust). **FNI lastel oli vähem tähelepanu probleeme** (p < .02), **vähem autistlikke iseloomujooni** (p < .02). **Perekesksete lapse eest hoolitsemise võtete kasutamine (FNI) NICU-s, näitas märkimisväärset paranemist neuroloogilises arengus, sotsiaalses empaatiavõimes/ mõistmises/suhtlemises ja tähelepanuga- ning käitumisega seotud probleemides enneaegsetel lastel.** Perekeskne ravi, mis soodustab emotsionaalset vastastikust mõju ema ja lapse vahel NICU-s, võib olla võtmeks, et muuta arengulist trajektoori enneaegsetel lastel.	**16. Family Nurture Intervention in the Neonatal Intensive Care Unit improves social-relatedness, attention, and neurodevelopment of preterm infants at 18 months in a randomized controlled trial** Welch MG, Morgan RF, Austin J, Hane AA, Stark RI, Hofer MA, Garland M, Glickstein SB, Brunelli SA Ludwig RJ, Myers MM Journal of Child Psychology and Psychiatry **2015** Mar 11. doi: 10.1111/ jcpp.12405
2014a. longitudinaalses prospektiivses quasi-eksperimentaalses kohortuuringus (teostatud aastatel 2008-2012) võrreldi meditsiinilisi ja neuroloogiliskäitumuslikke tulemusi kojukirjutamisel enneaegsetel sünnikaaluga <1500g. Uuriti, kas on	**17. Single-Family Room Care and Neurobehavioral and Medical Outcomes in**

seoseid NICU avatud palatitega (open-bay) vs ühe peretubadega disaini ja meditsiiniliste ja neuroloogiliskäitumuslike tulemuste vahel kojukirjutamisel enneaegsetel peale NICU muutmist ühe peretubadega NICU-ks. Kaasati 151 EA last avatud ruumiga NICU-s ja 252 EA last peale muutmist peretubadega palatitega NICU-ks. **Tulemused:** statistiliselt märkimisväärsed tulemused (kõik Ps <.05) näitasid, et lapsed ühe peretubadega NICU-s kaalusid rohkem koju kirjutamisel, neil oli kiirem kaalutõus, vajasid vähem meditsiinilisi protseduure, neil oli madalam gestatsioonivanus täieliku enteraalse toitmise saavutamisel ja vähem sepsist, näitasid paremat tähelepanuvõimet, vähem psühholoogilist stressi, vähem lihaspinget, vähem letargiat ja vähem valu. NICU erinevused laste kaalus väljakirjutamisel olid seotud arengulise toetusega; erinevused meditsiinilistes protseduurides olid seotud suurenenud ema kaasamisega. NICU erinevused tähelepanus olid vahendatud suurenenud arengulisest toetusest. Erinevused stressis ja valus olid seotud ema kaasamisega. Õed teatasid positiivsemast töö keskkonnast ja suhtumisest ühe peretubadega NICU-s. Meetmed ema kaasamiseks: ema kohalolek, rinnast/pudelist toitmine, NNK, ema hooldus lapse eest (toitmine, vannitamine, mähkmete vahetamine). **Järeldused: Ühe peretubadega NICU on seotud paranenud neuroloogiliskäitumuslike ja meditsiiniliste tulemustega enneaegsetel lastel, mis on seotud suurenenud arengulise toetusega ja emade kaasamisega.**	**Preterm Infants** Lester MB, Hawes K, Abar B, Sullivan M, Miller R, Bigsby R, Laptook A, Salisbury A, Taub M, Lagasse LL, F. Padbury JF. Pediatrics **2014;**134:754–760
2014a. avaldatud süstemaatilisse ülevaatesse nahk-naha kontakti mõjust valuvaigistamiseks protseduuridest tingitud valu korral vastsündinutele oli kaasatud üldiselt 19 tugevat uuringut, randomiseeritud kontrolluuringud või osaliselt randomiseeritud uuringud, topeltpimedad või ühekordselt pimedad uuringud. Laste arv n=1594: enneaegsed (15 uuringut) gestatsioonivanuses <37 nädala ja ajalised vastsündinud GV≥37-42nädalat (4 uuringut), kellele rakendati NNK-i valuliku protseduuri ajal. 15 uuringus n=744 valuliku protseduurina oli – kannatorge, 1 uuringus veenipunktsioon ja kannatorge n=50, 2-s intramuskulaarne süst, 1-s uuringus vaktsineerimised n=80. **Autorid järeldasid, et NNK on efektiivne mõõdetuna mõlema valu indikaatori: füsioloogilise** (südamesagedus, hingamissagedsus, hapniku saturatsioon, regionaalne infrapunaspektroskoopia) **ja käitumusliku indikaatori** (kuuldav kisa sekundites, kisa proportsioon protseduuriga, näo grimassid, keha liigutused) **muutustega ja nahk-naha kontakti on ohutu kasutada ühekordse valuliku protseduuri nagu kannatorke korral.** Puhtalt käitumuslikud indikaatorid kaldusid eelistama nahk-naha kontakti, samal ajal kui füsioloogilised indikaatorid üldiselt ei olnud mõjutatud erinevate tingimuste korral. Kuigi känguruhooldus on efektiivne, kasu suurus ei pruugi olla suur.	**18. Skin-to-skin care for procedural pain in neonates (Review)** Johnston C, Campbell-Yeo M, Fernandes A, Inglis D, Streiner D, Zee R **The Cochrane Database Syst Review, 2014**
2013a. avaldatud süstemaatilisse ülevaatesse analgeesiaks kasutatava sahharoosi mõjust, doosist ja ohutusest protseduurist tingitud valu korral vastsündinutel oli kaasatud 57 uuringut, 53	**19. Sucrose for analgesia in newborn infants undergoing**

olid randomiseeritud kontrolluuringud – uuringute kvaliteet oli üldiselt kõrge. Uuringutes oli kokku 4730 last, 27 uuringut ainult enneaegsete, 29 uuringut ajaliste ja 1 uuring enneaegsete ja ajaliste laste kohta. **Valulikud protseduurid:** kannatorge, veenipunktsioon, enneaegsete retinopaatia uuringul silmade läbivaatus, subkutaanne- ja intramuskulaarne süst, põie kateteriseerimine, nasogastraalsondi paigaldus, ümberlõikus. **Tulemusi uuringutes hinnati erinevate valu indikaatoritega nagu: füsioloogilised indikaatorid** (südamesagedus, hingamissagedus, perifeerses veres hapniku saturatsioon - SpO2, transkutaanne hapniku ja süsinikdioksiidi sisaldus (gaasivahetus mõõdetuna transkutaanselt - TcpO2, TcpCO2), kortisooli tase), **individuaalsed käitumuslikud indikaatorid** (kisa kestus, kisa proportsioon ajas, näo liigutsed/grimassid), valideeritud liitvalu skaala skoorid (sisaldades kombinatsioone käitumuslikest, füsioloogilistest, kontekstuaalsetest näitajatest) või nende kombinatsioonid ja valu korral kasutatava sahharoosi toimest psühhomotoorse arengu kaugtulemustele. **Tulemused** Tulemusi mõnedest uuringutest sai kombineerida metaanalüüsis. Ennneaegse lapse valu hindamise skaala (PIPP-Premature Infant Pain Profile scores) väärtuste võrdlusel peale kannatorget - sahharoosi saanute grupis olid märkimisväärselt madalamad PIPP väärtused 30sek. (weighted mean difference (WMD) -1.76; 95%CI -2.54 to - 0.97; 4 uuringut; 264 vastsündinut] ja 60sek. pärast (WMD-2.05; 95%CI -3.08 to -1.02; 3 uuringut; 195 vastsündinut). Enneaegsete retinopaatia (ROP) uuringul – silmade läbivaatus – sahharoos ei vähendanud märkimisväärselt PIPP väärtusi (WMD -0.65; 95% CI -1.88 to 0.59; 3 uuringut; 82 vastsündinut). Ei esinenud erinevusi ebasoodsates kaugtulemustes sahharoosi ja kontrollgrupi vahel. Sahharoos vähendas märkimisväärselt kogu kisa kestust (WMD -39 seconds; 95% CI -44 to -34; 2 uuringut; 88 vastsündinnut), aga ei vähendanud esimese kisa kestust kannatorke ajal (WMD -9 seconds; 95% CI -20 to 2; 3 uuringut; 192 vastsündinut). Hapniku saturatsioon (%) oli märkimisväärselt madalam lastel, kellele anti sahharoosi ROP uuringu ajal võrreldes kontrollgrupiga (WMD -2.6; 95% CI -4.9 to -0.2; 2 uuringut; 62 vastsündinut). Individuaalsete uuringute tulemused, mida ei saanud kasutada metaanalüüsis, toetasid neid tulemusi. Sahharoosi toime pikaaegsele psühhomotoorsele arengule ei ole teada. **<u>Autorid järeldasid</u>:** **-Sahharoos on ohutu ja efektiivne protseduurist tingitud valu leevendamiseks ühekordse valuliku protseduuri korral ja vähemal määral korduvate kannatorgete korral.** **-Sahharoosi efektiivset optimaalset doosi ei olnud võimalik kindlaks määrata, kuna uuringutes esinesid selle kohta vastuolud (optimaalne doos ajalistele ja enneaegsetele ei ole veel täpselt teada).** **-Sahharoos vähendab protseduuri valu minimaalse või**	**painful procedures** Stevens B, Yamada J, Lee GY, Ohlsson A **The Cochrane Database Syst Review, 2013**

kõrvaltoimeteta. **-Väikesed doosid 24% sahharoosi (0.01-0.02g) on efektiivsed väga väikese sünnikaaluga enneaegsetele, samas kui suuremad doosid (0.24-0.50g, 2ml 12%-50%) vähendavad kisa kestust ajalistel vastsündinutel** *(small doses of 24% sucrose (0.01 to 0.02 g) are efficacious in very-low birthweight infants while larger doses (0.24 to 0.50 g) reduce the proportion of time crying in term infants)* See tõend on integreeritud tõenduspõhisesse sahharoosi konsensusprotokolli, millest on tehtud juhised (Dunbar 2006, Lefrak 2006, Sharek 2006). **-Sahharoosi kasutatakse enneaegsete retinopaatia uuringul, veenipunktsioonil, subkutaanse süsti tegemisel, ümberlõikusel, põie kateteriseerimisel, nasogastraalsondi paigaldusel hospidaliseeritud vastsündinutel, kuid siiski on vajalikud edasised uuringud nende valulike protseduuride kohta vastuoluliste tõendite tõttu sahharoosi valu vähendavast toimest.** **-Käesoleva süstemaatilise ülevaate 4 uuringu metaanalüüsile baseerudes (Johntson 1999a, Stevens 1999, Gibbins 2002, Slater 2010), autorid soovitavad rutiinseks sahharoosi kaustamiseks annust 0.012-0.12g (0.05ml 24% sahharoosi -0.5ml 24% sahharoosi), mida manustada 2 minutit enne ühekordset kannatorget ja veenipunktsiooni.** **Kuna ülevaates on antud lai valik efektiivseid sahharoosi doose (näit. 2ml 12%-24%, 2ml 25%, 2ml 20-30%, 0.5-2ml 12%-50%,jne.) ja uuringud on heterogeensed, on vajalik edasine teadustöö täpsemate dooside määramiseks erinevate gestatsioonivanuste kohta.** **-Teised meetodid valu leevendamiseks on: tühja luti imemine ja nahk-naha kontakt/känguruhooldus – mida kasutada kombinatsioonis sahharoosiga valu vähendamiseks või valu vältimiseks.** -Kas korduvate sahharoosi dooside kasutamine on ohutu ja efektiivne erakordselt väikestele, ebastabiilsetele, ventileeritavatele (või nende kombinatsioonide korral) enneaegsetele – selleks on vajalikud edasised uuringud. -Vajalikud on teadusuuringud sahharoosi kasutamisest kombinatsioonis teiste mittefarmakoloogiliste ja farmakoloogiliste võtetega, minimaalse efektiivse sahharoosi doosi määramiseks ühekordse valuliku protseduuri ajal ja korduvate sahharoosi dooside kasutamise vahetust toimest (valu tugevus) ja kaugtulemustest (psühhomotoorne areng).	
2013a. avaldatud süstemaatilisse ülevaatesse/metaanalüüsi hõlmati 38 randomiseeritud kontrolluuringut protseduurist tingitud valu raviks kasutatavate magusate lahuste (v.a. sahharoosi) efektiivsusest vastsündinutel, (3785 vastsündinut – ajalised, enneaegsed). **35 uuringus käsitleti glükoosi mõju protseduuri valu raviks. Uuringute kvaliteet oli kõrge. Glükoosi doos varieerus 0,2-2ml 5%-50% glükoosini.** **Tulemused:** Kannatorge 21/38 uuringus, veenipunktsioon 11/38 uuringus. 3.6-punkti vähenes enneaegse vastsündinu valuskaala	**20. A systematic review and meta-analyses of nonsucrose sweet solutions for pain relief in neonates.** M Bueno, J Yamada, D Harrison, S Khan, A

skooring kannatorke ajal uuringutes (PIPP Skoor), mis võrdlesid **1-2ml 20% - 30% glükoosi** vs mitte ravimisega (2 uuringut, 124 vastsündinut; mean difference −3.6 [95% CI −4.6 to −2.6]; P<0.001; I2=54%). **Märkimisväärselt vähenes kisa kestus peale veenipunktsiooni 25-30% glükoosi saanud lastel võrreldes vett või mitte ravi saanud lastega.** (3 uuringut, 130 last; risk difference −0.18 [95% CI −0.31 to −0.05]; P=0.008, number needed to treat = 6 [95% CI 3 to 20]; I2=63%). **Järeldused: käesolevast süstemaatilisest ülevaatest ja metaanalüüsist järeldub, et glükoos vähendab valu skoore ja kisa ühekordse kannatorke ja veenipunktsiooni korral.** **-Tulemused näitavad, et 20%-30% glükoosilahused omavad analgeetilist toimet ja neid võib soovitada alternatiivina sahharoosile protseduuri valu leevendamiseks tervetele ajalistele ja enneaegsetele vastsündinutele.**	Ohlsson, T Adams-Webber, J Beyene, B Stevens **Pain Res Manag 2013;18(3):153-161.**
2012a. avaldatud süstemaatilisse ülevaatesse oli kaasatud 20 randomiseeritud kontrolluuringut või osaliselt randomiseeritud uuringut – seega tõendite kvaliteet on kõrge, enneaegsed < 37 nädala ja > 37 ajalised vastsündinud. Uuriti: rinnaga toitmine või rinnapiim protseduuri valu leevendamiseks vastsündinutel vs mitteravimine/teised võtted. **Autorid järeldasid nende uuringute tulemustest:** **-Kui võimalik, kasutada imetamist või rinnapiima andmist (suu kaudselt (oro- või nasogastraalsondiga) protseduuri valu leevendamiseks vastsündinutel ühe valuliku protseduuri korral võrreldes platseeboga, mähkimise ja voodisse panekuga, süles hoidmisega, luti andmisega või mitte vahelesegamisega**. **-Glükoosi/sukroosi manustamisega olid samasugused mõjud nagu valu leevendamisel imetamisega, s.t. kui imetada ei saa, soovitav alternatiivina kasutada glükoosi või sukroosi.** Rinnapiima toimet protseduuri valu leevendamisel (eriti korduvate protseduuride korral, haigetel enneaegsetel) enneaegsete populatsioonis peab uurima, kuna praegu on limiteeritud arv uuringuid, mis on hinnanud efektiivsust nende populatsioonis.	**21. Breastfeeding or breast milk for procedural pain in neonates.** **Shah PS, Herbozo C, Aliwalas LL, Shah VS. Cochrane Database Syst Rev. 2012**
2011a. süstemaatilises ülevaates hinnati protseduuri valu mittefarmakoloogilist ravi enneaegsetel vastsündinutel, ajalistel vastsündinutel (37n.-1k.), imikutel ja väikelastel – üle 1kuu kuni 36kuu vanuseni. Ülevaates oli kokku 51 randomiseeritud kontrolluuringut, n=3396, milledele kontrollgrupiks mitte ravisaanud lapsed – ülevaatel kõrge kvaliteet. Uuriti 13 erinevat tüüpi tavaliselt kasutatavaid mittefarmakoloogilisi ravivõtteid (v.a. rinnapiim, sahharoos, muusika), et määrata nende efektiivsust valu reaktsioonidele peale akuutset valulikku protseduuri (vahetult peale nõelatorget (’pain reactivity’) ja vähem vahetut reaktsiooni valule (’immediate pain-related regulation’). **Valu reaktiivsust:** mõõdeti esimese 30 sek.-i jooksul peale valuliku stimulatsiooni lõppu. **Vähem vahetut reaktsiooni valule /Immediate pain-related regulation:** mõõdeti pärast esimest 30.sekundit akuutse valuliku stiimuli järgselt. **Valulikud protseduurid, mida käsitleti ülevaates:** 29 uuringut	**22. Nonpharmacological management of procedural pain in infants and young children: An abridged Cochrane review** Riddell RP, Racine N, Turcotte K, Uman LS, Horton R, Osmun LD, Kohut SA, Stuart JH, Stevens B, Lisi D. **Pain Res Manage**

kannatorke kohta, 10 uuringut nõelaga-süstimise kohta, 6 uuringut veenipunktsiooni kohta, 2 uuringut NICU-s kaalumise ja 2 mähkme vahetuse kohta, 2 uuringut endotrahheaalse aspireerimise kohta. **Tulemused:** igat sekkumist uuringus analüüsiti eraldi vastavalt vanusegrupile: enneaegsed vastsündinud, ajalised ja vanemad imikud/väikelapsed. Suurim standardiseeritud keskmine differents (SMD) valu reaktiivsusele oli järgmine: **mittetoitmisega seotud imemine (rõngasluti, mittelakteeriva nibu imemine, valuleevendus on maksimaalne, kui imemine algab vähemalt 3 minutit enne valulikku protseduuri)** (preterm: −0.42 [95% CI −0.68 to −0.15]; neonate −1.45 [CI −2.34 to −0.57]), **känguruhooldus e. nahk-naha kontakt** (preterm −1.12 [95% CI −2.04 to −0.21]), ja **kinnimähkimine/*facilitated tucking*-lapse õrn kinnihoidmine, jalad painutatud ja kontrolli all** (preterm −0.97 [95% CI −1.63 to −0.31]). Vähem vahetu reaktsioon valule - suurimaks SMD oli: **mittetoitmisega seotud imemine** (preterm −0.38 [95% CI −0.59 to −0.17]; neonate −0.90 [CI −1.54 to −0.25]), **känguruhooldus e. NNK** 0.77 (95% CI −1.50 to −0.03]), **kinnimähkimine/kinnihoidmine** (preterm −0.75 [95% CI −1.14 to −0.36]), ja kiikumine/kinnihoidmine (neonate −0.75 [95% CI −1.20 to −0.30]). **Kokkuvõte: mitmetel mittefarmakoloogilistel ravivõtetel on piisavalt tõendeid toetamaks nende efektiivsust valuravis enneaegsetel ja tervetel vastsündinutel,** samas ei olnud ravivõtteid, millel on piisavalt tõendeid toetamaks nende mõju imikutele ja väikelastele. **-On piisavalt tõendeid, et soovitada protseduuri valuraviks mittefarmakoloogiliste ravivõtena enneaegsetele vastsündinutele känguruhooldust e. nahk-naha kontakti, mittetoitmisega seotud imemist, kinnimähkimist/kinnihoidmist.**	**2011;16(5):321-330.**
2013a. prospektiivse randomiseeritud kontrolluuringu eesmärgiks oli uurida kombineeritud mittefarmakoloogiliste võtete kasutamist enneaegsete laste une-ärkveloleku staadiumitele valulike protseduuride (kannatorge) ajal IIIa. intensiivravi osakonnas. Uuringus 100 last, gestatsioonivanus 26-37 nädalat. **Kokkuvõte: 1. kombineeritud ravi: tühja luti imemine** (1min. enne protseduuri), **suu kaudne sahharoos (0.2–2.0 ml 20% sahharoosi** **süstlaga 2 min enne nõelatorget, kogus sõltuvalt gestatsioonivanusest) ja** *facilitated tucking*. s.t. **lapse õrn kinnihoidmine soojade kätega** – (taktiilne ja sensoorne stiimul, laps painutatud asendis, üks käsi pea peal, teine keha peal) – **vähendasid efektiivsemalt lapse rahmeldamist ja kisa, kui rutiinne hooldus kannatorke ajal** (kerge puudutus ja suuline lohutamine) **Uuringus kasutatud 20% sahharoosi kogused gestatsioonivanuse järgi: GV 26n.-28n. -0,2ml: GV 28,1n.-30n.-0,5ml; GV 30,1n.-32n. – 1,0ml; GV 32,1-37n.-1,5ml; GV >37n.-2,0ml.** **2. lapsed, kes said: tühja luti imemine+suu kaudne sahharoos+ -**	**23. Effects of combined use of non-nutritive sucking, oral sucrose, and facilitated tucking on infant behavioural states across heel-stick procedures: A prospective, randomised controlled trial** Liaw JJ, Yang L, Lee CM, Fan HC, Chang YC, Cheng LP International Journal of Nursing Studies 50 (**2013)** 883–894

hoidmine või tühja luti imemine+suu kaudne sahharoos, neil esines rohkem vaikse une staadiumi võrreldes rutiinse hooldusega **3. suu kaudne sahharoos + lapse hoidmine, esines rohkem vahepealset une-ärkveloleku staadiumi võrreldes rutiinse hooldusega** **4. kannatorke ajal lapsed, kes olid külili asendis, esines rohkem vaikse une staadiumi võrreldes selili asendiga** **<u>Kokkuvõte:</u> 4 ravi kombinatsiooni erinevalt vähendasid erutust valuliku protseduuri ajal. Kombineeritud mitte farmakoloogiliste võtete: sahharoos-hoidmine, imemine-sahharoos ja imemine-sahharoos-hoidmine kasutamine vähendas efektiivsemalt lapse rahmeldamist või kisa võrreldes rutiinse hooldusega.** **<u>Kombinatsioonid:</u> imemine-sahharoos-hoidmine ja imemine-sahharoos soodustasid paremini lapse und võrreldes rutiinse hooldusega. Klinitsistid peaksid lapse une kaitsmiseks kasutama kombibatsioone imemine, sahharoos, hoidmine valulike protseduuride ajal.**	
2015a. Randomiseeritud kontrolluuring mitte-farmakoloogiliste võtete kasutamisest enneaegsetel lastel valust ja stressist tingitud käitumisele. Uuringus 100 last, gestatsioonivanus 26-37 nädalat. Tagajärgedeks olid: "äratõmbamis" käitumine (grimass, jäsemete ja keha sirutus või vingerdamine) ja eneserahustav käitumine (imemine, imemise otsimine, või käte suhu panemine või haaramisliigutused, käsi suu juurde liigutus). **<u>Kokkuvõte:</u> <u>Kombineeritud mittefarmakoloogiliste võtete kasutamine enne protseduuri:</u> imemine-sahharoos-hoidmine, imemine-sahharoos, sahharoos-hoidmine, imemine-hoidmine, - vähendasid efektiivselt lapse stressist tingitud või "äratõmbamis" käitumist. Eneserahustavat käitumist ei esinenud sagedamini või esines vähem, kui laps sai mingisugust kombineeritud mittefarmakoloogilist ravi võrreldes tavalise hooldusega lastega.** **<u>Kannatorge</u> võib olla atraumaatiline, kui selle tegemise ajal laps on stabiilne ja rahulik, õiges asendis ja rakendada hoidmist, sahharoosi ja imemist enne protseduuri. Neid tõendeid mittefarmakoloogilisest ravist kasutada kliinilises praktikas.**	**24. Development of atraumatic heel-stick procedures by combined treatment with non-nutritive sucking, oral sucrose, and facilitated tucking: A randomised, controlled trial** Yin T, Yang L, Lee TY, Li CC, Hua YM, Liaw JJ International Journal of Nursing Studies 52 **(2015)** 1288–1299
2012a. Randomiseeritud kontrollitud mitmekeskuselises uuringus intensiivravi osakondades võrreldi 2 mittefarmakoloogilist ravi võtet valu leevendamiseks üksikuna või kombinatsioonis korduvate (kannatorge) verevõtmiste protseduurida ajal, enneaegsetel gestatsioonivanuses 24-32 nädalat, n=71 last. Kasutati hoidmist või suu kaudselt sahharoosi andmist. **Hoidmine üksinda oli oluliselt vähem efektiivne leevendades korduvat protseduuri valu** (P , .002)**, kui sahharoosi <u>(0.2 mL/kg)</u> kasutamine.** Hoidmine kombinatsioonis sahharoosiga omas lisaväärtust paranemisfaasis madalamate valuskooridega (P = .003) võrreldes ühe ravivõtte kasutamisega. Ei olnud olulisi erinevusi	**25. Oral sucrose and "facilitated tucking" for repeated pain relief in preterms: a randomized controlled trial.** Cignacco EL, Sellam G, Stoffel L, Gerull R, Nelle M, Anand KJ, Engberg S

vastustes valule gestatsiooniaegades. **Järeldused:** **-Sahharoos koos ja ilma hoidmiseta omas valuvaigistavat toimet isegi enneaegsetel gestatsioonivanuses <32 nädala korduvate valulike protseduuride ajal.** **-Hoidmine üksinda ei olnud nii efektiivne ja seda ei saa soovitada kui mittefarmakoloogilist võtet, mis korduvate valulike protseduuride korral aitaks vastsündinul valust paraneda.**	Pediatrics **2012**;129:299-308**.**

Viited

Kokkuvõtte (abstract või kokkuvõtlikum info)	**Viide kirjandusallikale**
Stabilisation of the child directly after the birth **The Swedish National Board of Health and Welfare's assessment** • The care ought to be organised so that a neonatal team is on site when a child is born far too prematurely. o the child ought to have the option of being near his or her parents before being moved to the neonatal unit. *The assessment is based on systematic charting, WHO recommendations, guidelines from a European consensus panel of neonatologists and consensus between the chairpersons of the expert groups.* **Treatment of pain** Children who are born prematurely and who are cared for at neonatal intensive care units are often exposed to pain due to their immaturity, different states of health, complications and care procedures. The pain can have negative consequences in both the short and the long term because the immature child is in a sensitive period of strong growth and differentiation of the central nervous system. Therefore, the number of painful interventions ought to be minimised and painful conditions be treated. Pain ought in the first instance to be dealt with using non-pharmacological treatment, but there are circumstances when the pharmacological treatment of pain is necessary. The majority of the medicines used are not fully tested and documented (effect, safety and dose) for extremely premature infants, so the treatment is based largely on tried and tested experience rather than scientific support. The fact that medicines lack an approved indication need not mean that the knowledge is inadequate since there is often good clinical experience of them. Extremely premature infants ought to be ensured a pain-free existence as far as possible, despite the fact that they have other physiological conditions to react to and express their pain compared with full-term children. The risks of treatment with medicines (toxic effect and side effects) must be weighed against the pain the child perceives without pharmaceutical painkillers and also against the injuries that can arise due to	**Care of extremely premature infants A guideline for the care of children born before 28 full weeks of pregnancy have passed.** The Swedish National Board of Helth and Welfare. Published www.socialstyrelsen.se,September **2014**

the pain. This is a difficult but very important fine line to walk and modern neonatal treatment of pain is therefore based on a balanced, multimodal strategy [Thewissen et al. 2011]. This strategy involves regular pain assessment, individualist behaviour support (non-pharmacological) treatment and, if necessary, pharmacological treatment as well.

Pain assessment

The Swedish National Board of Health and Welfare's assessment

- For pain diagnostics, pain ought to be assessed with the help of valid instruments (adapted according to age, level of maturity and type of pain) as far as possible.

  The assessment is based on Swedish guidelines from the Swedish Child Pain Society and guidelines drawn up by an international consensus group.

Both international and national guidelines and procedures recommend that all units which care for newborn children must have procedures that include a structured pain assessment model [Anand 2001, Svensk Barnsmärtförening 2014]. It is fundamental for an objective pain assessment to be able to provide adequate and safe treatment of pain for these children. There is no golden rule for objective pain assessment, but different observational scales are usually used. However, it is urgent to choose valid instruments that have been designed for the child's level of maturity and type of pain, such as acute procedural pain or continuous pain and stress (for example through respirator treatment or postoperative care). Appendix 2 shows the pain assessment instruments that are often used and which are recommended in today's neonatal care.

Non-pharmacological treatment of pain

The Swedish National Board of Health and Welfare's assessment

- The number of painful interventions ought to be minimised.
- Extremely premature infants ought always to be given non-pharmacological, individualised care to reduce the perception of pain and stress. This may include
  - thinking through and optimising the care environment, calm for example;
  - the participation of the parents;
  - the use of skin-to-skin care and supportive cohesion;
  - ensuring that the child is replete, dry and warm before procedures;
  - ensuring that the child is lying comfortably;
  - ensuring that the child is given the option of something non-nutritive on which to suck.

  The assessment is based on Swedish guidelines from the Swedish Child Pain Society and guidelines drawn up by an international consensus group.

Children who are cared for at neonatal units undergo a large number of measures that are painful to a greater or lesser extent on a daily basis. The very smallest and youngest patients are the most sensitive and can also

experience nappy changing or turning over as painful. The basic principle is that the number of painful interventions should always be minimised.

There are several non-pharmacological strategies that can reduce the child's pain reaction and have a calming effect. The care environment ought to be optimised, including by minimising disruptive visual and audible impressions. An example of this is subdued direct lighting, particularly to start with when the child is especially sensitive.

The child ought to be replete, dry and warm before painful procedures. The child ought also to be assisted with something non-nutritive on which to suck, which means that the child sucks on something such as a dummy, a hand or a finger (its own or that of the parent) [Riddell et al. Cochrane Database Syst Rev 2011]. If possible, the parents ought always to be engaged in the treatment of pain, partly so that they can report the child's pain and partly because they will be able to offer supportive measures such as skin-to-skin care (HMH) or supportive cohesion [Behandling av barn i samband med smärtsamma procedure i hälso-och sjukvard – kunskapsdokument 2014].

Pharmacological treatment of pain

The Swedish National Board of Health and Welfare's assessment

- Each unit ought to have well designed pharmacological pain treatment procedures which are also suitable for acute situations. The procedures ought to cover pain in situations such as:
  - procedural pain, including intubation
  - postnatal and postoperative pain
  - treatment of continuous pain and stress during respirator treatment.
- Pharmacological treatment ought to be administered in good time before painful procedures and ought always to be supplemented with non-pharmacological support.

The assessment is based on Swedish guidelines from Swedish Chid Society and guidelines drawn up by an international consensus group.

More painful intervention, such as pinpricks, the insertion of a central venous catheter or of drainage, intubation, operation and respirator treatment, usually requires pharmacological treatment of pain in addition to the non-pharmacological treatment which always constitutes the basis of the pain treatment strategy.

The pharmacological treatment can include both analgesics (painkillers) and sedatives (calming or soporific medicines) which have been selected on the basis of how painful the condition or measure actually is. There is clinical experience of which preparations ought to be used for extremely premature infants, but the scientific support is limited. Medicines ought to be prescribed using a conscious strategy. Each unit ought to have procedures with proposed treatments that are well-established, that are safe to use even in an emergency situation, and that are carefully documented and followed up.

For mild to moderate pain, a painkilling effect can often be achieved by administering sweet solutions (concentrated glucose or sucrose) by mouth

to newborn children [Stevens et al. Cochrane Database Syst Rev 2013]. The positive effects have also been seen in extremely premature infants, even though the scientific support is limited [Johnston et al. 1997]. Premedication ought always in principle to be given prior to intubation as well as directly after the birth or in other acute situations when there is no intravenous access. Postoperative pain and painful conditions such as necrotising enterocolitis should always be treated pharmacologically. With respirator treatment, non-pharmacological support may be sufficient if there is no other reason for the pain such as a painful condition or during postoperative care. However, treatment with medicines may be relevant as age and treatment time increase because the perceived stress of respirator treatment can then increase [Bellu et al. Cochrane Database Syst Rev 2008].

Medicines ought to be administered in good time before a painful procedure. Where there are combinations of medicines, they should be given sequentially based on time of onset, properties and effect. Preparations with a rapid time of onset and short duration of effect are considered to be ideal for a short-term and acute procedure such as intubation [Barrington 2011]. For sedation, the child ought to have stable blood pressure because this always leads to some risk of a drop in blood pressure. Sedation with benzodiazepines is not advised for extremely premature infants [Ng et al. Cochrane Database Syst Rev 2012].

Medicinal substances are usually absorbed and eliminated more slowly in newborn children, which is much more the case in extremely premature infants. If several medicines are used simultaneously, an effective combination of as few medicines as possible needs to be found because combinations can be risky. However, in some cases, primarily when using opioids, it can be advantageous to use combinations of several different medicines where the effects of the different preparations fortify one another, which means that the strength of the doses can be reduced and thereby also the side effects of each individual medicine. This applies to postoperative care, for example, when treatment with Paracetamol, opioids and Clonidine may be appropriate.

The time to discontinue certain analgesics such as opioids ought to be individualised. The time depends on the dose that the child has received as well as the length of time for which the treatment has lasted. First of all there ought to be a gradual reduction in the size of the dose followed by a reduction in the number of doses. Abstinence symptoms may be difficult to interpret in extremely premature infants but if symptoms do arise, the original dose should be used and the dose not continue to be reduced until the child is abstinence-free.

Nursing

The care of extremely premature infants concentrates on saving lives but also on promoting the child's long-term health and development. Right from the birth and onwards throughout the care period, the nursing ought to be adapted to the child's relevant level of development so that stimuli are as beneficial as possible and negative effects of stress and pain as small as possible. High quality nursing ought to be individualised, support development and be centered around the family.

Care centered around the patient and the family

The Swedish National Board of Health and Welfare's assessment

- The care of extremely premature infants ought to be organised so that it is centered around the patient and the family. This means that the care should be:
    - individualised
    - support development
    - offer family care
    - offer integrated care
    - actively involve and inform the parents.

  The assessment is based on systematic charting and consensus between the chairpersons of the expert groups.

Care centered around the patient and the family is an approach whereby the care is not limited to just being disease-orientated but is extended to cover other needs of the child, parents and any siblings. The UN's Children's Convention forms the basis for the child's rights as an individual and as part of the family [Cornway et al 2006, Committe on hospital care and institute for patient-and family- centered care 2012]. There are also specific policy documents for family-centered [Levin 1999, Westrup et al. 1999] and neonatal nursing [Symington et al Cochrane Database Systemic Rev 2006, Individanpassad vard av underburna barn – NIDCAP, 2006]. **Care centered around the patient and the family involves the following:**

- Family care is offered, which means that parents and children are not separated The care ought thereby to offer accommodation for the parents to stay at the newborn's unit.
- Mothers with their own medical needs ought as far as possible to be integrated into the care with the child at the newborn unit.
- The family's individual needs being respected as far as possible.
- The parents' sensitive needs being noted. The parents ought to be offered psychosocial support and support in the bonding and the anaclytic process, which also includes nursing support (see also the chapter on nutrition).
- The parents being encouraged to take responsibility themselves for the child's nursing. The development benefits from parents being present for a lot of the time and from early interventions focusing on the interaction between the child and the parents.
- All information is shared with the parents if there is no obstacle in doing so in the Public Access to Information and Secrecy Act or Chap. 6, Sections 3 and 4 of the Parental Code.
- Facilitating the cooperation between parents and personnel.

Care centered around the patient and the family is key to successful bonding and the anaclytic process between children and parents. The anaclytic process is crucial to the development of the brain and the child's ability to handle stress, which in turn affects the child's general development and its future health. A good anaclytic process is also important so that the parents can feel secure in their parental role

[Montirosso et al. 2012]. However, the short pregnancy period can make this difficult because the parents may have a natural crisis reaction and because the anaclytic process has to be developed during the neonatal care period. Extremely premature infants also give weak signals and often have behaviour that is different and more difficult to interpret compared with full-term children [Schore et al. 2001, Lubbe et al. 2012]. It is therefore essential that the units have competence to read the premature child's signals.

Development-supporting nursing

Development-supporting care is based partly on the medical treatment but also on sociology and behavioural science The basis is the competence to understand the child's behaviour, to support the child's autoregulation (of the nervous system, alertness and interaction with the surroundings, for example) as well as benefitting the parents' and the care personnel's interaction with the child. Individually-adapted, development-supporting care ought to be offered since the care gives positive short-term effects and increases the child's well-being during the neonatal care period, even though the long-term effects have weaker scientific support. Adapting the care to the individual and striving for calm surroundings increases the possibilities of undisturbed sleep and a more beneficial development for the child. The lower the lower level of maturity, the clearer the positive effects on the child's development.

There are different intervention programmes that can be used within the care of extremely premature infants. **NIDCAP (newborn individualised developmental care and assessment programme)** is a programme that can be carried out throughout the care period, starting directly after the birth, which is significant from a neurobiological development perspective [NIDCAP Federation International, 2014]. A key moment in NIDCAP is the individual assessment of the child's responsiveness to and capacity to handle stimuli. Other elements include the positioning of the child, adaptation of the surrounding environment as well as conduct at the time of specific care measures. There is some scientific support to show that NIDCAP has positive short-term effects on the more serious forms of bronchopulmonary dysplasia as well as reducing the incidence of necrotising enterocolitis and improving the situation for the families. The studies also showed positive long-term effects on the children's behaviour and motor skills [Symington et al. Cochrane Database Syst Rev 2006, Wallin et al. 2009]. Other studies have shown that NIDCAP has a positive impact on the maturity of the brain and on the cognitive development [Als et al. 2012, Als et al. 2004] as well as leading to shorter care periods [Peters et al. 2009].

Many neonatal units use modified NIDCAP care which works towards the same target with the same means but do not fully include all observational elements. **The methods MITP (mother infant transaction programme)** and **IBAIP (infant behavioural assessment and intervention programme)** are based on the same theoretical basis as NIDCAP. The methods are primarily intended to be used following discharge and aim to strengthen the communication between children and parents. MITP has been shown to reduce the level of stress in the parents during the child's

first year and a beneficial effect was seen on the child's cognitive development at five years of age [Kaaresen et al. 2008, Olafsen et al. 2008]. IBAIP has also been shown to improve the motor development for children with a birth weight of less than 1 500 g and, at the five-year follow-up, showed better cognition (performance IQ) as well as the ability to coordinate visual impression and movement patterns (visual-motor integration) [Koldewijn et al. 2013, Van Hus et al 2013]. **One method that is often used and which ought to be offered 24 hours a day is skin-to-skin care** (HMH, **also called kangaroo mother care, KMC).** The method is based on the fact that the child has direct skin contact with a parent or a close family member. The scientific support for the positive effects of the method is found mainly in the low income countries [Conde-Agudelo et al. Cochrane Database Syst Rev 2011, Moore et al. Cochrane Database Syst Rev 2012, Nyqvist et al. 2010]. Studies have shown that HMH contributed to lower mortality, fewer serious infections and other medical conditions, better temperature regulation as well as shortened care periods. The method has also been shown to act as a pain alleviator [Cochrane Database Syst Rev, Ridell et al. 2011, Akcan et al. 2009, Cignacco et al. 2007] and to have a positive effect on the child's growth, the mothers' satisfaction and bonding with the child following discharge [Kramer et al. 2008], the mother's milk production and the child's nursing behaviour [Renfrew et al. 2010]. In turn, a longer nursing period has a positive effect on the child's cognitive development [Kramer et al, 2008].	

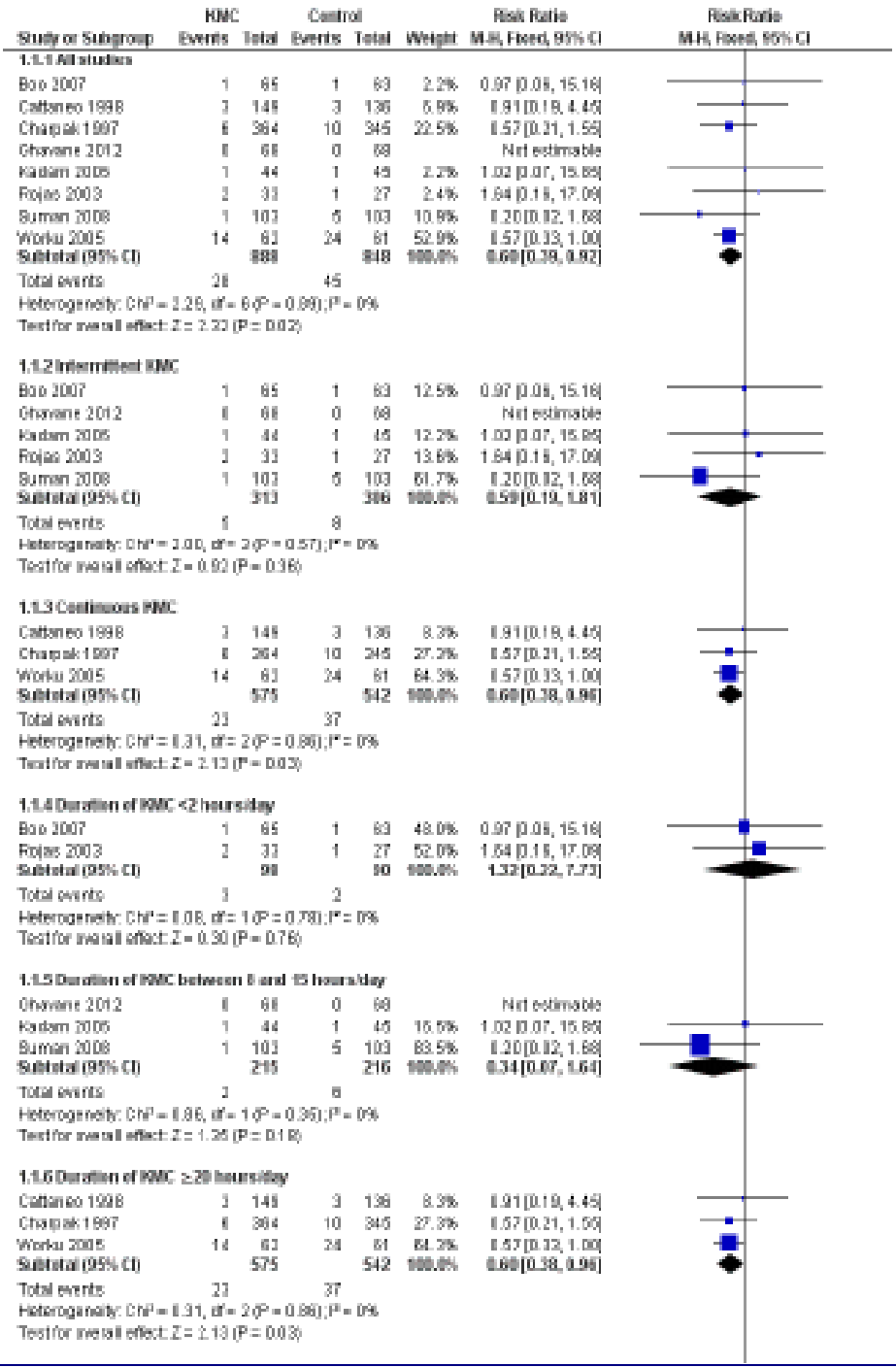
Viited

Kokkuvõtte (abstract või kokkuvõtlikum info)	**Viide kirjandusallikale**
Family involvement is a key to realize the potential for long-lasting positive effects on physical, cognitive and psychosocial development of all babies, including those in the neonatal intensive care unit (NICU). Family-centered developmental care (FCDC) recognizes the family as vital members of the NICU health-care team. As such, families are integrated into decision-making processes and are collaborators in their baby's care. Through standardized use of FCDC principles in the NICU, a foundation is constructed to enhance the family's lifelong relationship with their child and optimize	**1. Review article Recommendations for involving the family in developmental care of the NICU baby** Craig JW, Glick C,

development of the baby. Recommendations are made for supporting parental roles as caregivers of their babies in the NICU, supporting NICU staff participation in FCDC and creating NICU policies that support this type of care. These recommendations are designed to meet the basic human needs of all babies, the special needs of hospitalized babies and the needs of families who are coping with the crisis of having a baby in the NICU.	Phillips R, Hall SL, Smith J, Browne J Journal of Perinatology **(2015)** 35, S5–S8;
A B S T R A C T **Background** Kangaroo mother care (KMC), originally defined as skin-to-skin contact between a mother and her newborn, frequent and exclusive or nearly exclusive breastfeeding, and early discharge from hospital, has been proposed as an alternative to conventional neonatal care for low birthweight (LBW) infants. **Objectives** To determine whether there is evidence to support the use of KMC in LBW infants as an alternative to conventional neonatal care. **Search methods** The standard search strategy of the Cochrane Neonatal Group was used. This included searches in MEDLINE, EMBASE, LILACS, POPLINE, CINAHL databases (all from inception to March 31, 2014) and the Cochrane Central Register of Controlled Trials (*The Cochrane Library*, Issue 3, 2014) In addition, we searched the web page of the Kangaroo Foundation, conference and symposia proceedings on KMC, and Google scholar. **Selection criteria** Randomized controlled trials comparing KMC versus conventional neonatal care, or early onset KMC (starting within 24 hours after birth) versus late onset KMC (starting after 24 hours after birth) in LBW infants. **Data collection, analysis** Data collection and analysis were performed according to the methods of the Cochrane Neonatal Review Group. **Main results** Eighteen studies, including 2751 infants, fulfilled inclusion criteria. Sixteen studies evaluated KMC in LBW infants after stabilization, one evaluated KMC in LBW infants before stabilization, and one compared early onset KMC with late onset KMC in relatively stable LBW infants. Thirteen studies evaluated intermittent KMC and five evaluated continuous KMC. At discharge or 40-41 weeks' postmenstrual age, KMC was associated with a reduction in the risk of mortality (typical risk ratio (RR) 0.60, 95% confidence interval (CI) 0.39 to 0.92; eight trials, 1736 infants), nosocomial infection/sepsis (typical RR 0.45, 95% CI 0.27 to 0.76), hypothermia (typical RR 0.34, 95% CI 0.17 to 0.67), and length of hospital stay (typical mean difference 2.2 days, 95% CI 0.6 to 3.7). At latest follow up, KMC was associated with a decreased risk of mortality (typical RR 0.67, 95% CI 0.48 to 0.95; 11 trials, 2167 infants) and severe infection/sepsis (typical RR 0.56, 95% CI 0.40 to 0.78). Moreover, KMC was found to increase some measures of infant growth, breastfeeding, and mother-infant attachment. There were no significant differences between KMC infants and controls in neurodevelopmental and neurosensory impairment at one year of corrected age. Sensitivity analysis suggested that the inclusion of studies with high risk of bias did not affect the	**2. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants (Review)** Conde-Agudelo A, Díaz-Rossello JL The Cochrane Database Syst Review **2014**

general direction of findings or the size of the treatment effect for the main outcomes.

Figure 3. Forest plot of comparison: 1 Kangaroo mother care versus conventional neonatal care, outcome: 1.1 Mortality at discharge or 40-41 weeks' postmenstrual age. Overall, KMC was associated with a statistically significant reduction in the risk of mortality at discharge or 40-41 weeks' postmenstrual age (3.2% vs 5.3%; typical RR 0.60, 95% CI 0.39 to 0.92; $I2$ = 0%; NNT for benefit 47, 95% CI 31 to 236).



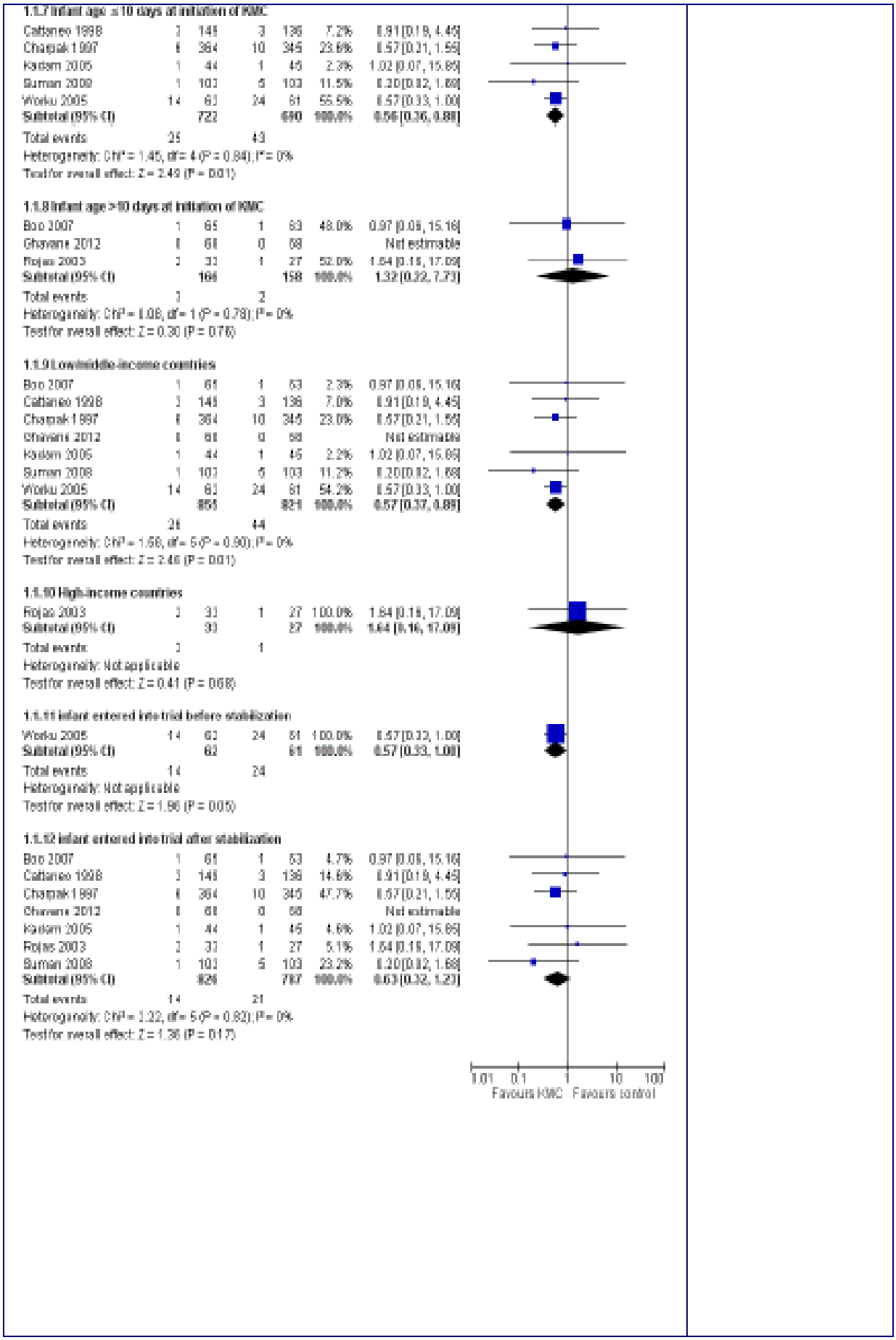
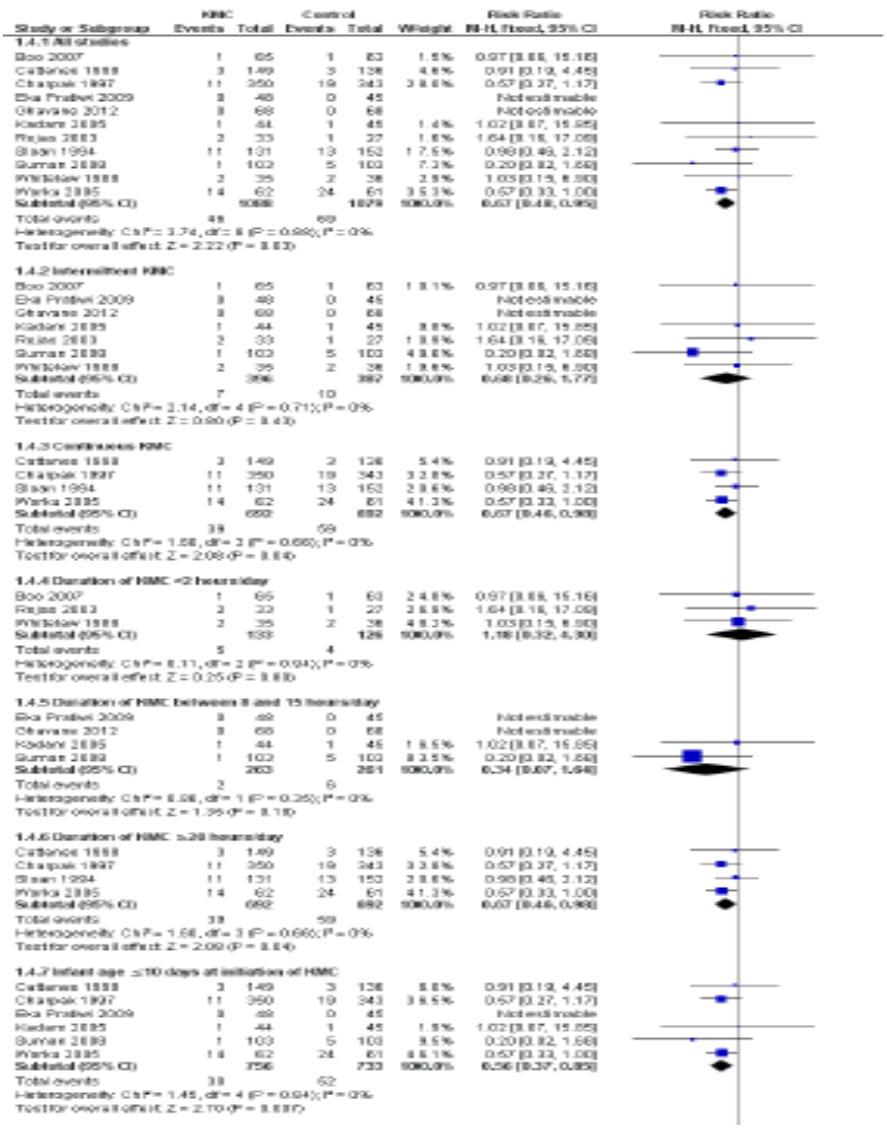

1.1.7 Infant age ≥ 10 days at initiation of KMC
Cattaneo 1998 3 148 3 136 7.2% 0.91 [0.18, 4.45]
Charpak 1997 8 364 10 345 23.6% 0.57 [0.21, 1.55]
Kadam 2005 1 44 1 45 2.3% 1.02 [0.07, 15.85]
Suman 2008 1 103 5 103 11.5% 0.20 [0.02, 1.68]
Worku 2005 14 63 24 61 55.5% 0.57 [0.33, 1.00]
Subtotal (95% CI) 722 690 100.0% 0.56 [0.36, 0.88]
Total events 25 43
Heterogeneity: Chi² = 1.45, df = 4 (P = 0.84); I² = 0%
Test for overall effect: Z = 2.48 (P = 0.01)
1.1.8 Infant age >10 days at initiation of KMC
Boo 2007 1 65 1 63 48.0% 0.97 [0.06, 15.16]
Ghavane 2012 0 68 0 68 Not estimable
Rojas 2003 2 33 1 27 52.0% 1.64 [0.18, 17.09]
Subtotal (95% CI) 166 158 100.0% 1.32 [0.32, 7.73]
Total events 3 2
Heterogeneity: Chi² = 0.08, df = 1 (P = 0.78); I² = 0%
Test for overall effect: Z = 0.30 (P = 0.76)
1.1.9 Low/middle-income countries
Boo 2007 1 65 1 63 2.3% 0.97 [0.06, 15.16]
Cattaneo 1998 3 148 3 136 7.0% 0.91 [0.18, 4.45]
Charpak 1997 8 364 10 345 23.0% 0.57 [0.21, 1.55]
Ghavane 2012 0 68 0 68 Not estimable
Kadam 2005 1 44 1 45 2.2% 1.02 [0.07, 15.85]
Suman 2008 1 103 5 103 11.2% 0.20 [0.02, 1.68]
Worku 2005 14 63 24 61 54.2% 0.57 [0.33, 1.00]
Subtotal (95% CI) 855 821 100.0% 0.57 [0.37, 0.88]
Total events 26 44
Heterogeneity: Chi² = 1.56, df = 5 (P = 0.90); I² = 0%
Test for overall effect: Z = 2.46 (P = 0.01)
1.1.10 High-income countries
Rojas 2003 2 33 1 27 100.0% 1.64 [0.18, 17.09]
Subtotal (95% CI) 33 27 100.0% 1.64 [0.18, 17.09]
Total events 2 1
Heterogeneity: Not applicable
Test for overall effect: Z = 0.41 (P = 0.68)
1.1.11 Infant entered into trial before stabilization
Worku 2005 14 63 24 61 100.0% 0.57 [0.33, 1.00]
Subtotal (95% CI) 63 61 100.0% 0.57 [0.33, 1.00]
Total events 14 24
Heterogeneity: Not applicable
Test for overall effect: Z = 1.96 (P = 0.05)
1.1.12 Infant entered into trial after stabilization
Boo 2007 1 65 1 63 4.7% 0.97 [0.06, 15.16]
Cattaneo 1998 3 148 3 136 14.6% 0.91 [0.18, 4.45]
Charpak 1997 8 364 10 345 47.7% 0.57 [0.21, 1.55]
Ghavane 2012 0 68 0 68 Not estimable
Kadam 2005 1 44 1 45 4.6% 1.02 [0.07, 15.85]
Rojas 2003 2 33 1 27 5.1% 1.64 [0.18, 17.09]
Suman 2008 1 103 5 103 23.2% 0.20 [0.02, 1.68]
Subtotal (95% CI) 826 787 100.0% 0.63 [0.32, 1.23]
Total events 14 21
Heterogeneity: Chi² = 3.22, df = 5 (P = 0.82); I² = 0%
Test for overall effect: Z = 1.36 (P = 0.17)
0.01 0.1 1 10 100
Favours KMC Favours control

Figure 4. Forest plot of comparison: 1 Kangaroo mother care versus conventional neonatal care, outcome: 1.1 Mortality at latest follow up.



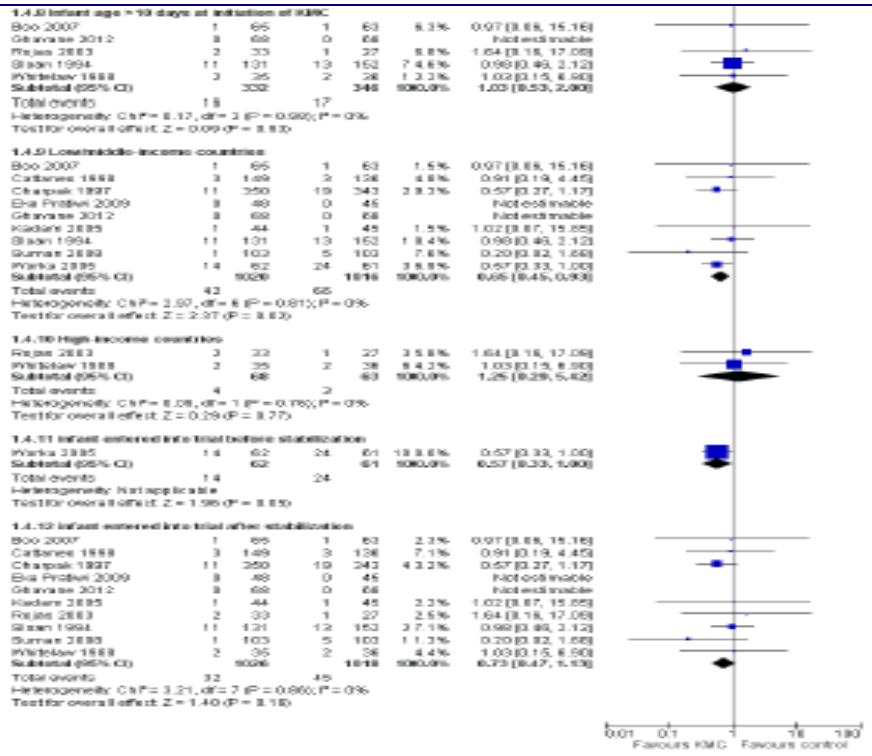


Figure 5. Forest plot of comparison: 1 Kangaroo mother care versus conventional neonatal care, outcome: 1.2 Severe infection/sepsis at latest follow up - stabilized infants.

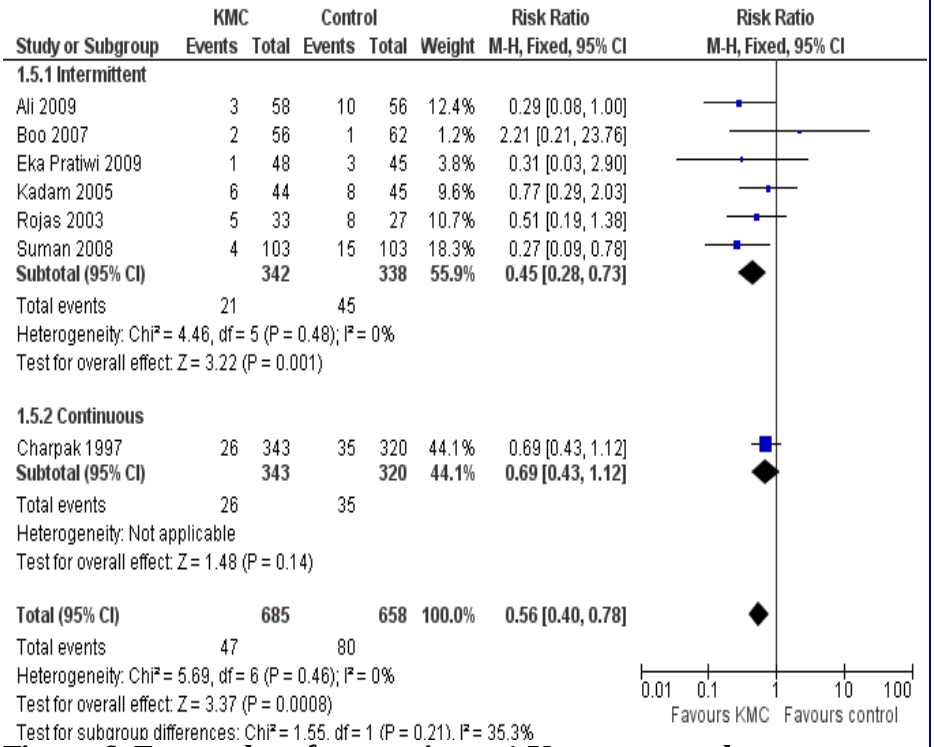
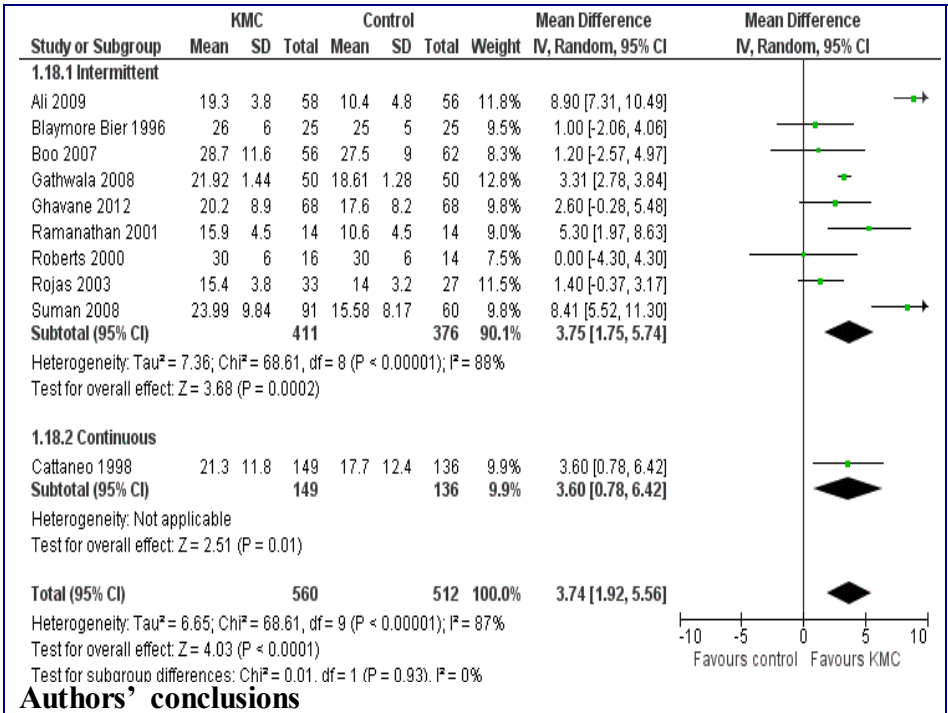


Figure 6. Forest plot of comparison: 1 Kangaroo mother care versus conventional neonatal care, outcome: 1.10Weight gain at latest follow up (g/day) - stabilized infants.



Authors' conclusions

The evidence from this updated review supports the use of KMC in LBW infants as an alternative to conventional neonatal care mainly in resource-limited settings. Further information is required concerning effectiveness and safety of early onset continuous KMC in unstabilized or relatively stabilized LBW infants, long term neurodevelopmental outcomes, and costs of care.

A U T H O R S ' C O N C L U S I O N S Implications for practice

Although current evidence is mainly limited to the use of KMC in low/middle-income countries, **there is emerging evidence that use of KMC could improve breastfeeding rates in high-income countries**. **Subgroup analyses suggest that both continuous and intermittent KMC are beneficial for stabilized LBW infants.** Since the control group in studies evaluating continuous KMC was in incubators or radiant warmers, the potential beneficial effects of KMC on morbidity and mortality of LBW infants would be expected to be greatest in settings in which conventional neonatal care is unavailable. **To date, early onset continuous KMC in unstabilized or relatively stabilized LBW infants cannot be recommended based on the evidence provided by two small trials.**

Abstract

Aim: To describe parental experiences of providing skin-to-skin care (SSC) to their newborn infants.

Background: SSC care for newborn infants has been reported to have positive physiological and psychological benefits to the infants and their parents. No systematic review regarding parental experiences has been identified.

Design: In this first part of a meta-study, the findings of a systematic literature review on parental experience of SSC care are presented.

Data sources: Four databases were searched, without year or language limitations, up until December 2013. Manual searches were performed

3.a Parental experiences of providing skin-to-skin care to their newborn infant *Part 1: A qualitative systematic review

in reference lists and in a bibliography of the topic. **Review methods:** After a quality-appraisal process, data from the original articles were extracted and analysed using qualitative content analysis. **Results:** The systematic and manual searches led to the inclusion of 29 original qualitative papers from nine countries, reporting experiences from 401 mothers and 94 fathers. Two themes that characterized the provision of SSC emerged: a restoring experience and an energy-draining experience. *M. Anderzén-Carlsson et al.* Table III. Overview of themes, sub-themes, and categories. **Conclusion: This review has added scientific and systematic knowledge about parental experiences of providing SSC. Further research about fathers' experiences is recommended. It constitutes a valuable complement to previous metaanalyses on physiological and psychosocial outcomes on mothers and infants, and it offers a more detailed picture than the previous meta-analyses on the topic.** From an evidence-based perspective, this systematic review shows that mothers and fathers who provide SSC can experience the SSC as restorative, as well as energy-draining.	Anderzen-Carlsson A, CaravalhoLampy Z, & Eriksson M. Int J Qualitative Stud Health Well-being **2014**, 9: 24906 REVIEW ARTICLE

Themes	A restorative experience			An energy-draining experience	
Sub-themes	Feeling good	Doing good	Becoming us	Feeling exposed	Hurting others
Categories	A heart-warming experience Relieving emotional suffering A rewarding experience A natural instinct A learning experience Finding a role Improved self-esteem Feeling of control A supportive environment	A way of knowing and understanding Important for the infant	A bonding experience Intimate togetherness	Environment as an obstacle A physical and emotional burden Incongruence between wishes and demands Uncertainty about the purpose of and own skill in providing SSC	Fear of hurting Feeling insufficient towards the family

Abstract **Aim:** To synthesize and interpret qualitative research findings focusing on parental experiences of skin-to-skin care (SSC) for newborn infants. **Background:** SSC induces many benefits for newborn infants and their parents. Three meta-analyses have been conducted on physiological outcomes, but no previous qualitative meta-synthesis on parental experiences of SSC has been identified. **Design:** The present meta-synthesis was guided by the methodology described by Paterson and co-workers. **Data sources:** Four databases were searched, without year or language limitations, up until December 2013. Manual searches were also performed. The searches and subsequent quality appraisal resulted in the inclusion of 29 original qualitative papers from 9 countries, reporting experiences from 401 mothers and 94 fathers. **Review methods:** The meta-synthesis entails a meta-data analysis, analysis of meta-method, and meta-theory in the included primary studies. Based on the three analyses, the meta-synthesis represents a new interpretation of a phenomenon. The results of the meta-data	**3.b Parental experiences of providing skin-to-skin care to their newborn infant *Part 2: A qualitative systematic review** Anderzen-Carlsson A, CaravalhoLampy Z, & Eriksson M. Int J Qualitative Stud Health Well-being

analysis have been presented as a qualitative systematic review in a separate paper.**Results:** When synthesizing and interpreting the findings from the included analyses, a theoretical model of Becoming a parent under unfamiliar circumstances emerged. Providing SSC seems to be a restorative as well as an energy-draining experience. A supportive environment has been described as facilitating the restorative experience, whereas obstacles in the environment seem to make the provision of SSC energy-draining for parents. When the process is experienced as positive, it facilitates the growth of parental self-esteem and makes the parents ready to assume full responsibility for their child. An overview of the themes, subthemes, and categories and their relation to the included articles is provided in Table II.

Table II. Overview of the identified themes, sub-themes, and categories.

	A restorative experience													An energy-draining experience						
	Feeling good									Doing good		Becoming us		Feeling exposed				Hurting others		
	A heart-warming experience	Relieving emotional suffering	A rewarding experience	A natural instinct	A learning experience	Finding a role	Improved self-esteem	Feeling of control	A supportive environment	A way of knowing and understanding	Important for the infant	A bonding experience	Intimate togetherness	Environment as an obstacle	The physical and emotional burden	Incongruence between wishes and demands	Uncertainty about the purpose of and own skill in providing SSC	Fear of hurting	Feeling insufficient toward the family
Affonso et al. 1989	x	x		x	x	x	x	x	x	x		x			x		x		
Affonso et al. 1993	x				x	x	x	x		x	x	x	x		x	x		x	
Arvidsdotter & Tyrell 2010									x		x	x	x			x			x
Blomqvist & Nyqvist 2010							x		x					x	x	x			x
Blomqvist et al. 2012						x			x	x	x			x	x				x
Blomqvist et al. 2013									x	x	x				x	x		x	x
Braga et al. 2008		x			x						x	x		x	x			x	
Byaruhanga et al. 2008	x			x				x			x	x		x		x		x	
Carmona et al. 2005		x		x					x		x		x			x			x
Campos et al. 2008	x	x	x		x	x	x	x	x		x	x							x
Dalbye et al. 2011	x		x								x	x	x	x				x	x
Duarte & de Sena 2004			x					x			x	x			x				x
Elmirito et al. 2008					x	x	x			x	x	x	x	x			x	x	x
Finigan & Davies 2004	x		x	x		x	x				x	x	x			x			
Furlan et al. 2003	x	x			x	x	x	x	x	x	x	x	x	x	x	x			x

Table II (Continued)

	A restorative experience													An energy-draining experience						
	Feeling good									Doing good		Becoming us		Feeling exposed				Hurting others		
	A heart-warming experience	Relieving emotional suffering	A rewarding experience	A natural instinct	A learning experience	Finding a role	Improved self-esteem	Feeling of control	A supportive environment	A way of knowing and understanding	Important for the infant	A bonding experience	Intimate togetherness	Environment as an obstacle	The physical and emotional burden	Incongruence between wishes and demands	Uncertainty about the purpose of and own skill in providing SSC	Fear of hurting	Feeling insufficient toward the family
Heinemann et al. 2013	x					x			x				x	x		x			
Helth & Jørdan 2013	x				x	x	x	x			x	x		x		x		x	
Johnson 2007	x					x	x			x	x	x	x			x	x	x	x
Lamy et al. 2011	x				x	x	x		x	x	x	x			x				x
Leonard & Mayers 2008	x				x	x	x		x	x	x	x	x	x	x	x	x	x	x
Martins & dos Santos 2006					x		x		x		x				x	x	x	x	x
Moura & Araújo 2005	x	x	x			x	x	x			x	x		x	x	x	x		
Nakajima 2002		x					x			x	x	x	x		x			x	
Neu 1999				x		x	x		x		x	x		x	x	x	x	x	
Neu 2004	x							x	x	x	x	x	x	x	x	x		x	
Neves et al. 2010	x							x	x	x	x	x		x	x			x	
Roller 2005	x					x	x	x			x	x		x	x				
Toma 2005					x	x		x	x	x	x	x	x	x	x	x	x	x	x
Toma et al. 2007					x			x	x		x	x		x	x	x		x	x

Conclusion: The results show that SSC can be interpreted not only as a family-including and important health care intervention but also in terms of actually becoming a parent. The process of becoming a parent in this specific situation is influenced by external factors in three different levels; family and friends, community, and society at large. The descriptions of providing SSC are similar to what has previously been described as the

2014;9: 24906

REVIEW ARTICLE

natural process of becoming a mother or a father.	
ABSTRACT: The birth of a premature infant can have adverse effects on the mood of mothers and on the interaction patterns between parents and their preterm babies. **The aim** of the present systematic review was to examine whether the Kangaroo Mother Care (KMC) intervention can attenuate these adverse psychological effects of a premature birth by ameliorating negative maternal mood and/or promoting more positive interactions between preterm infants and their parents. **The results showed that although findings of studies were inconclusive, there is some evidence to suggest that KMC can make a positive difference on these areas. Specifically, it was found that KMC can improve negative maternal mood (e.g., anxiety or depression) and promote more positive parent–child interactions. Limitations and directions for future research are discussed.** **KANGAROO MOTHER CARE** KMC was introduced in 1978 in Bogota, Colombia by the pediatrician Edgar Rey (Ruiz-Pel´aez, Charpak, & Cuervo, 2004) as a way to solve the problem of insufficient resources in hospitals where there was a demand for incubators (Doyle, 1997). It was first used to maintain the infant's temperature within normal range, through contact with the caregiver's body. KMC is currently used widely in Western as well as developing countries for parent–low birth weight infant dyads, and the models of application include continuous and intermittent KMC (Nyqvist et al., 2010). **Continuous KMC is commonly used in developing countries, but is also applied in some high-tech NICU** (Blomqvist & Nyqvist, 2010; Nyqvist et al., 2010). **It involves continuous skin-to-skin contact between mother and baby, from birth until (at least) the 40th week, ideally accompanied by breastfeeding, discharge when the infant is medically stable, and careful follow-up** (Cattaneo, Davanzo, Uxa, & Tamburlini, 1998; Nyqvist et al., 2010). **Intermittent KMC is commonly used in Western countries to facilitate bonding between caregivers and infants and is applied for shorter periods daily for a numbers of days** (Nyqvist et al., 2010). **During KMC, the infant is placed in skin-to-skin contact with the mother's, father's, or caregiver's chest in a frontal position with the infant's head turned sideways; the airway is secured so that obstruction to breathing is prevented** (Nyqvist et al., 2010). To maintain appropriate body temperature, the infant may wear a hat, socks, or diaper and is usually placed under the caregiver's clothes or covered with a blanket (Cattaneo et al., 1998; Nyqvist et al., 2010). Elastic cloth bands also can be used to maintain the infant's position (Nyqvist et al., 2010). **At the same time, it is recognized that caregivers who provide KMC should be provided with adequate support and information while education and training needs to be offered to healthcare staff** (Cattaneo et al., 1998; Nyqvist et al., 2010). Finally, consistent protocols and guidelines for KMC need to be in place in healthcare facilities (Cattaneo et al., 1998; Nyqvist et al., 2010).	**4. Effects of Kangaroo Mother Care on maternal mood and interaction patterns between parents and their preterm, low birth weight infants: A Systemic review** Athanasopoulou E., Fox JRE Infant Mental Health Journal, Vol.35(3), **2014**

Many researchers have reported positive outcomes of KMC on the infant's physiological state. The benefits include better cognitive development, reduction of infections and positive outcomes on sleep and crying, temperature, weight gain, heart and respiratory rates, energy expenditure and oxygenation (Dodd, 2005; Hall, & Kirsten, 2008; Ludington-Hoe, 2011; Tessier, Cristo, Nadeau, & Schneider, 2011). **Moreover, positive psychological effects have been identified for infants and their families, such as positive outcomes on mother–infant interaction, maternal mood, and sense of coping** (Charpak et al., 2005; Tallandini & Scalembra, 2006; Tessier et al., 2011).

Aim: This systematic review is the first to synthesize and evaluate research findings from randomized and nonrandomized controlled trials on the effects of KMC on parent–preterm infant interaction patterns and/or maternal mood. **Participants**. Eligible studies included preterm and low birth weight infants (healthy or otherwise) and their caregivers (mothers and fathers)—biological parents or otherwise. Infants' gestational age had to be ≤37 weeks, as infants born within this age range are considered preterm (McCarton, Wallace, Divon, & Vaughan, 1996). There was no specific cutoff point for birth weight, but eligible studies had to describe their sample as low birth weight. **Study design.** Primary randomized and other controlled clinical trials that utilize a quasi-experimental design (e.g., non-equivalent groups design) were included in the review. A total of 13 randomized and nonrandomized controlled trials examining the effects of KMC on maternal mood and/or parent– preterm infant interaction were identified and retrieved.

Summary.

KMC and Parental Mood

Nine studies have examined the effects of KMC on the mood of mothers of preterm, low birth weight babies. Five of those have found significant differences between the mood of mothers in the KMC group and those in the control group (De Macedo, Cruvinel, Lukasova,&D'Antino, 2007; Feldman et al., 2002; Lai et al., 2006; Tallandini & Scalembra, 2006; Tessier et al., 1998) **while four did not** (Ahn, Lee, & Shin, 2010; Miles, Cowan, Glover, Stevenson, & Modi, 2006; Roberts, Paynter, & McEwan, 2000; Whitelaw, Heisterkamp, Sleath, Acolet, & Richards, 1988).

Specifically, **Tessier et al.** (1998) reported **that mothers in the KMC group felt more competent in looking after their babies and were less stressed when separated from them, as compared to mothers in the control group. At the same time, however, they reported that they felt less supported during their babies' stay at the NICU and more socially isolated. In a similar vein, two more studies have found that mothers who performed KMC alone** (Tallandini & Scalembra, 2006) **or combined KMC with relaxing music** (Lai et al., 2006) **reported lower stress**. Moreover, **Feldman et al.** (2002) **found that mothers in the KMC group were less depressed, as compared to mothers in the control group, and perceived their infants as more normal.** However, the infants' level

of medical risk was found to be a significant factor in both groups, as mothers of infants in high risk had higher depression scores, and this was not ameliorated by KMC. Finally, De Macedo et al. (2007) **reported that mothers in the KMC group felt calmer, stronger, more energetic, contented and tranquil, better coordinated, more clear-headed and quick-witted, more relaxed, attentive, proficient, friendly, and happier.** Furthermore, the lack of information on the exact amount of KMC that was performed by caregivers makes it difficult to draw conclusions on the amount of KMC that is required for the intervention to be effective.

KMC and Parent–Preterm Infant Interaction Patterns

Researchers **in nine studies investigated the effects of KMC on parent–preterm infant interaction patterns.** Researchers **in seven** of those studies **detected significant improvements in the KMC groups, as compared to control groups** (Ahn et al., 2010; Feldman et al., 2002; Feldman et al., 2003; Gathwala, Singh, & Balhara, 2008; Neu & Robinson, 2010; Tallandini & Scalembra, 2006; Tessier et al., 1998), **while in two studies they did not** (Chiu & Anderson, 2009; Miles et al., 2006).

Follow-up measurements at 41 weeks and 3 and 6 months showed that some of the improvements were still apparent. Specifically, Ahn et al. (2010) found that mothers in the KMC group demonstrated stronger attachment to their babies than did mothers in the control group. Specifically,mothers tended to be more sensitive toward their infants when they had spent more time in the NICU. **At 3 months**, Gathwala et al. (2008) reported that mothers in the KMC group picked up their babies more often, slept with them in their bed, were thinking of their babies more frequently, and did not go out without them. They also were more involved in their infant's care and gained more pleasure from interactions with them. Moreover, Feldman et al. (2003) found that both parents in the KMC group created a more sensitive and stimulating home environment through their interactions with their children and with each other. **At 6 months,** it also was found that mothers in the KMC groups had maintained their sensitivity and positive interactions with their infants (Feldman et al., 2002; Feldman et al.,2003).

Positive effects were observed in some of the infants who received KMC. Some infants in the KMC groups showed less negative emotions during play (Feldman et al., 2003) and more positive behaviors during reunion with their mother (Neu & Robinson, 2010). They also were better at expressing their needs and more responsive to their mothers (Tallandini & Scalembra, 2006), as compared to infants who received routine care.

Conversely, researchers in two studies did not detect a significant difference in mother–infant interaction patterns between KMC and control groups (Chiu & Anderson, 2009; Miles et al., 2006). Interaction patterns were found to be similar between KMC and control groups at 4, 6, 12, and 18 months. Moreover, in the study by Chiu and Anderson (2009), infants in the control group were more

responsive to their mothers than were the infants in the KMC group at 6 months of age, but this difference was no longer apparent by 12 and 18 months of age. **In summary, the findings of the reviewed studies have suggested that KMC can have positive effects on maternal mood and parent–infant interaction patterns.**	
A B S T R A C T **Background** Mother-infant separation postbirth is common in Western culture. Early skin-to-skin contact (SSC) begins ideally at birth and involves placing the naked baby, head covered with a dry cap and a warm blanket across the back, prone on the mother's bare chest. According to mammalian neuroscience, the intimate contact inherent in this place (habitat) evokes neurobehaviors ensuring fulfillment of basic biological needs. This time may represent a psychophysiologically 'sensitive period' for programming future physiology and behavior. **Objectives** To assess the effects of early SSC on breastfeeding, physiological adaptation, and behavior in healthy mother-newborn dyads. **Search methods** We searched the Cochrane Pregnancy and Childbirth Group's Trials egister (30 November 2011), made personal contact with trialists, and consulted the bibliography on kangaroo mother care (KMC) maintained by Dr. Susan Ludington. **Selection criteria** Randomized controlled trials comparing early SSC with usual hospital care. **Data collection and analysis** We independently assessed trial quality and extracted data. Study authors were contacted for additional information. **Main results** Thirty-four randomized controlled trials were included involving 2177 participants (mother-infant dyads). Data from more than two trials were available for only eight outcome measures. For primary outcomes, we found a statistically significant positive effect of early SSC on reastfeeding at one to four months postbirth (13 trials; 702 participants) (risk ratio (RR) 1.27, 95% confidence interval (CI) 1.06 to 1.53, and SSC increased breastfeeding duration (seven trials; 324 participants) (mean difference (MD) 42.55 days, 95% CI - 1.69 to 86.79) but the results did not quite reach statistical significance (P = 0.06). Late preterm infants had better cardio-respiratory stability with early SSC (one trial; 31 participants) (MD 2.88, 95% CI 0.53 to 5.23). Blood glucose 75 to 90 minutes following the birth was significantly higher in SSC infants (two trials, 94 infants) (MD 10.56 mg/dL, 95% CI 8.40 to 12.72). The overall methodological quality of trials was mixed, and there was high heterogeneity for some outcomes. **Types of participants** Mothers and their healthy full term or late preterm newborn infants (34 to less than 37 completed weeks' gestation) having early SSC starting less than 24 hours after birth, and controls undergoing standard patterns of care. Four studies (Anderson 2003; Bergman 2004; Chwo 1999; Syfrett 1996) were done with healthy late preterm infants who were assigned to the normal newborn nursery. Three studies (Gouchon 2010; McClellan 1980; Nolan 2009)	**5. Early skin-to-skin contact for mothers and their healthy newborn infants** Moore ER, Anderson GC, Bergman N, Dowswell T The Cochrane Database Syst Review **2012**

were conducted with mothers scheduled for repeat cesarean birth using regional anesthesia. One study (Huang 2006) was conducted with hypothermic, but otherwise healthy, newborns post-cesarean birth with spinal anesthesia. One paper reported results for studies carried out in three different sites and we have treated these as three different studies in the data and analysis (Sosa 1976a; Sosa 1976b; Sosa 1976c).

Types of interventions

Early SSC for term or late preterm infants can be divided into several subcategories.

(a) In 'birth SSC', the infant is placed prone skin-to-skin on the mother's abdomen or chest during the first minute postbirth. The infant is suctioned while on the mother's abdomen or chest, if medically indicated, thoroughly dried and covered across the back with a prewarmed blanket. To prevent heat loss, the infant's head may be covered with a dry cap that is replaced when it becomes damp. Ideally, all other interventions are delayed until at least the end of the first hour postbirth or the first successful breastfeeding.

(b) In 'very early SSC', beginning approximately 30 to 40 minutes postbirth, the naked infant, with or without a cap, is placed prone on the mother's bare chest. A blanket is placed across the infant's back.

(c) 'Early SSC' can begin anytime between one and 24 hours postbirth. The baby is naked (with or without a diaper and cap) and is placed prone on the mother's bare chest between the breasts.

The mother may wear a blouse or shirt that opens in front, or a hospital gown worn backwards, and the baby is placed inside the gown so that only the head is exposed. What the mother wears and how the baby is kept warm and what is placed across the baby's back may vary. **What is most important is that the mother and baby are in direct ventral-to-ventral SSC and the infant is kept dry and warm.** In the future these groups may be analyzed separately. However, at present, not enough studies are available for subgroup analysis. Standard contact includes a number of diverse conditions, infants held swaddled or dressed in their mothers arms, or infants placed in open cribs or under radiant warmers in the mother's room or elsewhere with no holding allowed.

A U T H O R S ' C O N C L U S I O N S

Implications for practice

***Breastfeeding outcomes*:** this review does provide evidence to support current practices as recommended by the UNICEF endorsed Baby Friendly Hospital Initiative, in which SSC is encouraged for the first hour after birth. There is, however, inadequate evidence with respect to details such as timing of initiation, dose of skin-toskin contact (SSC) and technique. This review does not address subsequent ongoing SSC as an intervention to support breastfeeding. It is, however, noteworthy that an intervention practiced for a short time at birth should have measurable breastfeeding effects one to four months postbirth.

***Infant outcomes*:** the significant increase in blood glucose, and

maintenance of infant temperature in the neutral thermal range are both clinically important, and lend support to current American Academy of Pediatrics recommendations for the use of SSC in the first hour after birth (American Academy of Pediatrics 2005). Clearly there is a relationship between improved breastfeeding and higher blood glucose. In terms of evolutionary biology, and mammalian studies, this higher value may in fact be the norm, and a loweringmay reflect the autonomic nervous system evoking a separation distress response, consuming excess calories (Christensson 1995). This is further supported by the significantly increased crying seen in separation versus SSC (three studies). The decreased crying is in itself clinically important for other reasons as described in the background (Ludington-Hoe 2002). Late-preterm infants are at increased risk for hypoglycemia and hypothermia which can worsen any symptoms of respiratory distress (Raju 2006). The SCRIP score attempts to provide a composite measure of cardiorespiratory stability. Only one study reported this, with significant benefit in favor of SSC, providing further support for the use of early SSC. While differences in particular cardiorespiratory outcomes are evident, these are open to different interpretations, and mean little without a sense of trend and direction in terms of stabilization and physiological self-regulation. Although a number of the infant physiological outcomes, (except SCRIP scores, blood glucose, infant crying, and maintenance of physiological parameters), demonstrated little or no clinically significant differences with or without SSC, no negative short- or long-term effects were found. Based on the available evidence, SSC appears to have some clinical benefit, especially for temperature and cardio-respiratory stability in late preterm infants. ***Attachment outcomes*:** despite the variability in dose and timing of the intervention, there is at least a small effect on several dimensions of maternal neurobehavior in relation to her infant. This is consistent with evolutionary biology theory, in which infant survival depended on an immediate care-giving imperative. There is no benefit shown in any study from infants being separated. The main results of the meta-analysis, and from the single studies, indicate that SSC appears to have a positive effect on breastfeeding one to four months postbirth, blood glucose, infant crying and on infant temperature stability. The timing of the intervention may be important, because most infants are very alert in the first two hours postbirth and, if undisturbed and unmedicated, will self-attach to the nipple, and do so correctly, at approximately 55 minutes postbirth. However,Widstrom 2011 noted that it may take some infants up to 45 minutes to latch after they reach the mother's nipple.The temperature of a healthy newly delivered infant will remain in a safe range, provided ventral-to-ventral SSC is uninterrupted; the infant is thoroughly dried and covered across the back with a prewarmed blanket; and the head is covered with a dry cap that is replaced if it becomes damp. These practices need to be incorporated into hospital routines along with the stipulation that mothers and newborn infants	

should not be left alone and unattended by medical personnel in the delivery or recovery room during this transitional period (Dageville 2008). **P L A I N L A N G U A G E S U M M A R Y** **Early skin-to-skin contact for mothers and their healthy newborn infants** Skin-to-skin contact between a mother and her baby at birth reduces crying, and helps the mother to breastfeed successfully. In many cultures, babies are generally cradled naked on their mother's bare chest at birth. Historically, this was necessary for the baby's survival. In recent times, in some societies such as in industrialized countries more babies are born in hospital, and as part of usual hospital care babies are often separated and swaddled or dressed before being given to their mothers. **It has been suggested that hospital routines may significantly disrupt early mother and baby interactions and have harmful effects.** This review was done to see if there was any impact of early skin-to-skin contact between the mother and her newborn baby on infant health, behavior, and breastfeeding. The review included 34 randomized studies involving 2177 mothers and their babies. It showed that babies exposed to skin-to-skin contact interacted more with their mothers and cried less than babies receiving usual hospital care. Mothers were more likely to breastfeed in the first one to four months, and tended to breastfeed longer, if they had early skin-to-skin contact with their babies. Babies were possibly more likely to have a good early relationship with their mothers but this was difficult to measure. The overall methodological quality of trials was mixed. There was variation in how the intervention was implemented, including the time of skin-to-skin contact started after the birth and how long it lasted, the outcomes looked at and how they were measured. No clear negative outcomes were reported in association with skin-to-skin contact.	
Abstract Background: Skin-to-skin care has been adopted all over the world, although physiological changes during or after it have not been evaluated very well. The purpose of the present study was therefore to investigate whether skin-to-skin contact for newborn babies and their mothers affects body temperature, heart rate and oxygen saturation of the babies. **Methods**: Studies investigating body temperature, heart rate and oxygen saturation of babies during and/or after skin-to-skin contact were systematically searched and reviewed. Meta-analyses to examine the effects and metaregression analyses to investigate correlations between the effects and birthweight, duration of the care, environmental temperature, and resources of the setting, were conducted. **Results**: A total of 23 studies were included. Meta-analyses showed evidence of an increase in body temperature (weighted mean difference [WMD] 0.22°C, P < 0.001) and a decrease in saturation of babies (WMD -0.60%; P = 0.01) during skin-to-skin care, compared with those before skin-to-skin care. Increase in body temperature was more evident in middle–low-income settings (WMD, 0.61°C, P < 0.001) than high-	**6. Meta-analysis of physiological effects of skin-to-skin contact for newborns and mothers** Mori R,Khanna R, Debbie P, Nakayama T *Pediatrics International,* **2010**; 52;161–170 doi: 10.1111

income settings (WMD 0.20°C, P < 0.001). Both the positive effect on body temperature and the negative effect on saturation were more marked in cold environments than where the environmental temperature was higher (WMD 0.18°C, P < 0.001; WMD -0.82%, P = 0.02).

N	Income setting	Preterm/ Term	Birthweight (g)	Gestational age (weeks)	Duration of SSC (min)s	Outcome measurements	
						Timing	Parameters
9	High	Preterm	1060	28	10	Before/during/after	Heart rate/saturation
22	High	Preterm	1200	29	60	Before/during/after	Temperature/heart rate
8	High	Preterm	1061	28	240	Before/during/after	Temperature/heart rate
44	Middle	Term	3574	39	90	Before/during	Temperature
39	High	Term	3396	39	30	Before/during/after	Temperature
25	High	Term	3385	N/R	90	Before/during	Temperature
14	High	Term	3155	40	80	Before/during	Temperature
7	High	Preterm	779	26	71.5	Before/during/after	Temperature/heart rate/ saturation
25	High	Term	N/R	N/R	120	Before/during	Temperature
53	High	Preterm	1247	30	90	Before/during/after	Temperature/heart rate/ saturation
10	High	Term	N/R	N/R	15	Before/during	Temperature
24	Middle	Term	N/R	N/R	60	Before/during	Temperature/heart rate/ saturation
13	Low	Preterm	N/R	33	240	Before/during/after	Temperature
9	High	Term	3100	39	60	Before/during	Temperature
61	High	Preterm	1225	30	30	Before/during/after	Temperature/heart rate/ saturation
12	High	Preterm	2130	35	180	Before/during	Temperature/heart rate/ saturation
11	Middle	Preterm	2237	36	120	Before/during	Temperature
6	Middle	Preterm	2300	36	360	Before/during/after	Temperature
16	High	Preterm	1411	31	150	Before/during/after	Temperature
11	High	Preterm	1876	34	180	Before/during/after	Temperature/heart rate/ saturation
20	High	Preterm	1315	28	60	Before/during/after	Heart rate/saturation
38	High	Preterm	1452	32	60	After/during/after	Temperature/heart rate/ saturation
39	High	Preterm	1110	28	60	After/during/after	Temperature/heart rate/saturation

Climatology Network.[16]

Table 1 Description of included studies

Study Author, published year	Place of study City, country	Temperature of the city† (°C)
Acolet *et al.* 1989[28]	London, UK	10.4
Bauer *et al.* 1997[23]	Berlin, Germany	8.9
Bosque *et al.* 1995[24]	San Francisco, USA	14.1
Bystrova *et al.* 2003[32]	St Petersburg, Russia	5.3
Chiu *et al.* 2005[30]	Cleveland, USA	10
Christensson *et al.* 1992[31]	Madrid, Spain	14.2
Christensson *et al.* 1995[33]	Madrid, Spain	14.2
Clifford & Barnsteiner 2001[34]	Philadelphia, USA	12.2
Durand *et al.* 1997[36]	El Paso, USA	17.5
Fohe *et al.* 2000[25]	Magdeburg, Germany	8.6
Gardner 1979[38]	Chicago, USA	11
Huang *et al.* 2002[39]	Taipei, Taiwan	21.9
Ibe *et al.* 2004[27]	Lagos, Nigeria	26.5
Karlsson 1996[29]	Goteborg, Sweden	6.7
Legault & Goulet 1995[26]	Montreal, Canada	6.3
Ludington *et al.* 1991[18]	Los Angeles, USA	16.5
Ludington *et al.* 1993[37]	Cali, Colombia	23.7
Ludington *et al.* 1999[20]	Cali, Colombia	23.7
Ludington *et al.* 2000[11]	Richland, USA	12.1
Ludington *et al.* 2004[12]	Richland, USA	12.1
Messmer *et al.* 1997[22]	Miami Beach, USA	23.5
Closa *et al.* 1998[35]	Tarragona, Spain	16.2
Wieland *et al.* 1995[19]	Berlin, Germany	8.9

†Annual average temperature obtained from the Global Historical
N/R, not reported.

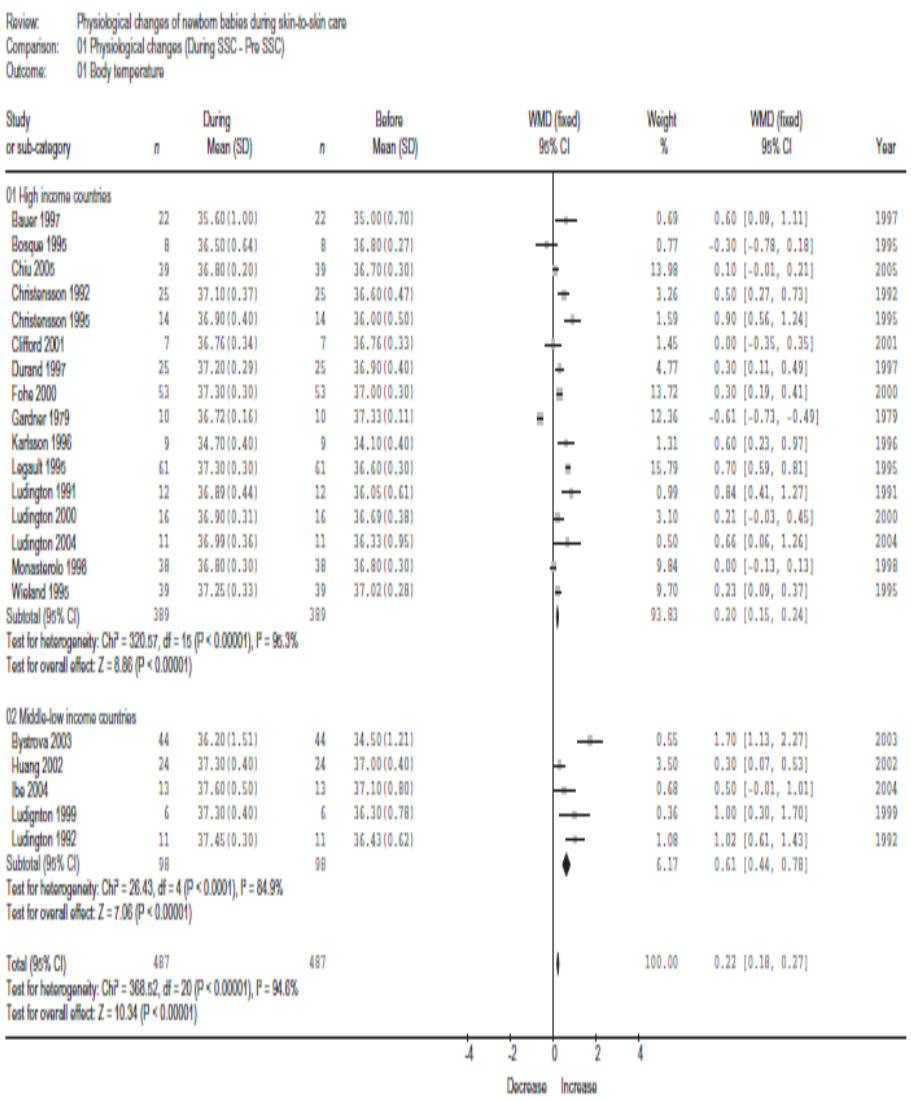


Fig. 1 Forest plot: effect on body temperature during skin-to-skin care, compared with that before skin-to-skin care, stratified by resource of settings. CI, confidence interval; SSC, skin-to-skin care; WMD, weighted mean difference.

Table 2 Results of meta-analysis and meta-regression

Meta-analysis		Body temperature (°C)
No. studies		21
Overall results		0.22 [0.18–0.27)
Test for heterogeneity		I2 = 94.6%
Meta-regression analysis		Correlation coefficient
No. studies		21
Temperature of the city	°C	−0.05
Income of the country	high/mid-low	0.82
Birthweight	low/normal	0.04
Duration of skin-to-skin care	duration(min)	0.002

Meta-analysis		Body temperature (°C)
No. studies		12
Overall results		0.14 (0.09–0.18)
Test for heterogeneity		I2 = 53.2%
Meta-regression analysis		Correlation coefficient
No. studies		12
Temperature of the city	Celsius degree	−0.03
Income of the country	high/mid-low	0.34
Birthweight	low/normal	−0.64
Duration of skin-to-skin care	duration(min)	−0.0004

Effects during skin-to-skin care, compared with before skin-to-skin care				
	Heart rate (beats/min)		Saturation (%)	
	12		10	
$P < 0.001$	2.04 (−0.04 to 4.12)	$P = 0.05$	−0.60 (−1.05 to −0.15)	$P = 0.01$
$P < 0.001$	I2 = 27.8%	$P = 0.17$	I2 = 12.7%	$P = 0.33$
P	Correlation coefficient	P	Correlation coefficient	P
	12		10	
0.06	0.64	0.17	0.07	0.51
0.007	−14.47	0.04	−0.59	0.70
0.85	N/A		N/A	
0.25	0.14	0.55	−0.001	0.88

Effects after skin-to-skin care, compared with before skin-to-skin care				
	Heart rate (beats/min)		Saturation (%)	
	10		8	
$P < 0.001$	−0.07 (−2.27 to 2.13)	$P = 0.95$	−0.48 (−0.97 to 0.02)	$P = 0.06$
$P = 0.01$	I2 = 0%	$P = 0.86$	I2 = 0%	$P = 0.81$
P	Correlation coefficient	P	Correlation coefficient	P
	10		8	
0.004	0.37	0.20	0.11	0.05
0.25	N/A		N/A	
0.38	N/A		N/A	
0.61	0.008	0.56	−0.001	0.82

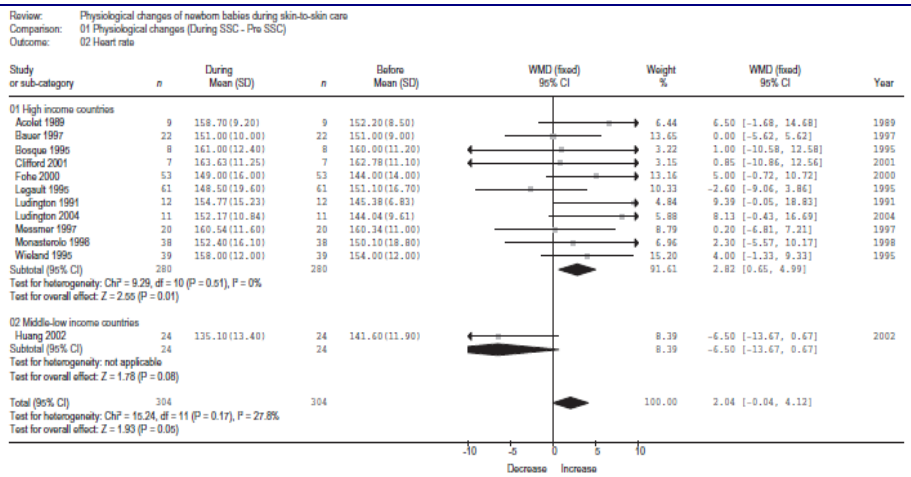


Fig. 3 Forest plot: effect on heart rate during skin-to-skin care, compared with that before skin-to-skin care, stratified by resource of the settings. CI, confidence interval; SSC, skin-to-skin care; WMD, weighted mean difference.

Fig. 4 Forest plot: effect on heart rate after skin-to-skin care, compared with that before skin-to-skin care. CI, confidence interval; SSC, skin-to-skin care; WMD, weighted mean difference.

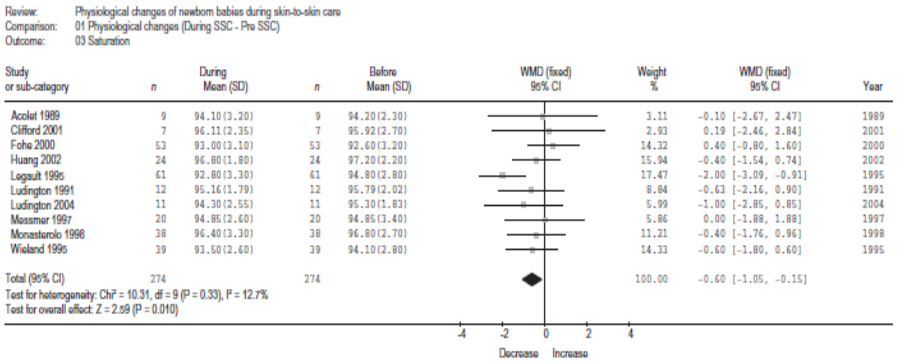


Fig. 5 Forest plot: effect on saturation during skin-to-skin care, compared with that before skin-to-skin care. CI, confidence interval; SSC, skin-to-skin care; WMD, weighted mean difference.

Implication for clinical practice

Considering the overall effects of Kangaroo Mother Care and/or skin-to-skin care in low–middle-income countries, this type of care can be promoted in these settings for stable low- and normal birthweight infants. This does not imply any changes for current configurations. In particular, babies at risk of apnea of prematurity should not given skin-to-skin care without adequate monitoring of saturation and respiratory status. The environment seems also to play an important role in this care. Attention should be paid to ensure appropriate and adequate environment throughthe care.

Conclusion Skin-to-skin care is an effective way to warm babies, especially where resources are limited and where the environment is relatively cold. Monitoring, however, of the saturation and respiratory status of the babies throughout the care, where resources are relatively affluent, should be considered, taking the costs of monitoring into account.

Background 'Kangaroo mother care' (KMC) includes thermal care through continuous skin-to-skin contact, support for exclusive breastfeeding or other appropriate feeding, and early recognition/response to illness.

Whilst increasingly accepted in both high- and low-income countries, a Cochrane review (2003) did not find evidence of KMC's mortality

7. 'Kangaroo mother care' to prevent neonatal deaths due to preterm birth complications

benefit, and did not report neonatal-specific data.

Objectives The objectives of this study were to review the evidence, and estimate the effect of KMC on neonatal mortality due to complications
of preterm birth.

Methods We conducted systematic reviews. Standardized abstraction tables were used and study quality assessed by adapted GRADE methodology. Meta-analyses were undertaken.

Results We identified 15 studies reporting mortality and/or morbidity outcomes including nine randomized controlled trials (RCTs) and six observational studies all from low- or middle-income settings. Except one, all were hospital-based and included only babies of birth-weight <2000 g (assumed preterm). The one community based trial had missing birthweight data, as well as other limitations and was excluded. Neonatal-specific data were supplied by two authors. **Meta-analysis of three RCTs commencing KMC in the first week of life showed a significant reduction in neonatal mortality** [relative risk (RR) 0.49, 95% confidence interval (CI) 0.29–0.82] **compared with standard care**. A meta-analysis of three observational studies also suggested significant mortality benefit (RR 0.68, 95% CI 0.58–0.79). **Five RCTs suggested significant reductions in serious morbidity for babies** <2000 g (RR 0.34, 95% CI 0.17–0.65).

Table 1 RCTs identified wh ...hich compare mortality outcomes in babies receiving KMC to those ...receiving standard care

Study	References	Country	Case definition (numbers in trial)	Median day of commencing KMC	Outcome	Design/ limitations
1	Charpak *et al.*,[8] 1997[a]	Colombia (facility)	Neonates <2000 g (*n* = 746)	4 days	Mortality at 12 months but provided neonatal specific data	RCT—outcome assess not blinded
2	Suman *et al.*,[15] 2008	India (facility)	Neonates <2000 g (*n* = 206)	3.7 days	Mortality at 9 months but provided neonatal specific data	RCT—outcome assess not blinded
3	Worku *et al.*,[16] 2005	Ethiopia (facility)	Neonates <2000 g (*n* = 123)	10 h	Neonatal mortality	RCT—poor description of R and follow up
X	Sloan *et al.*,[14] 2008	Bangladesh (community)	All neonates (*n* = 4165) (<2000 g = 166 and analysis restricted to <2000 g)	4 h	Neonatal mortality	Cluster RCT, more erratic implementation of KMC. Birthweight data missing for 65%. Possible undercounting of deaths
X	Sloan *et al.*,[17] 1994[a]	Ecuador (facility)	Neonates <2000 g (*n* = 300)	12.4 days	Mortality at 6 months	RCT—outcome assess not blinded
X	Cattaneo *et al.*,[18] 1998[a][b]	Mexico, Indonesia, Ethiopia (facility)	Neonates 1000–1999 g (*n* = 285)	10 days	Pre-discharge mortality	RCT—outcome assess not blinded

X indicates not included in th...his analysis because intervention (KMC) only commenced after the first week of life and >75% of deaths in very low birth weight babies occur during this time. See text for ...r details and sensitivity analysis.

[a]Included in Cochrane 2003, (...Conde-Agudelo A *et al.*[11]

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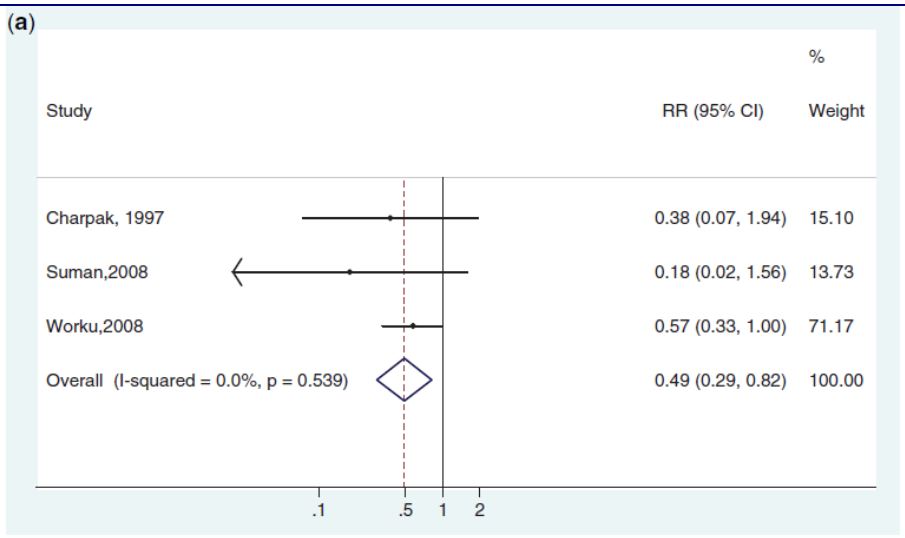

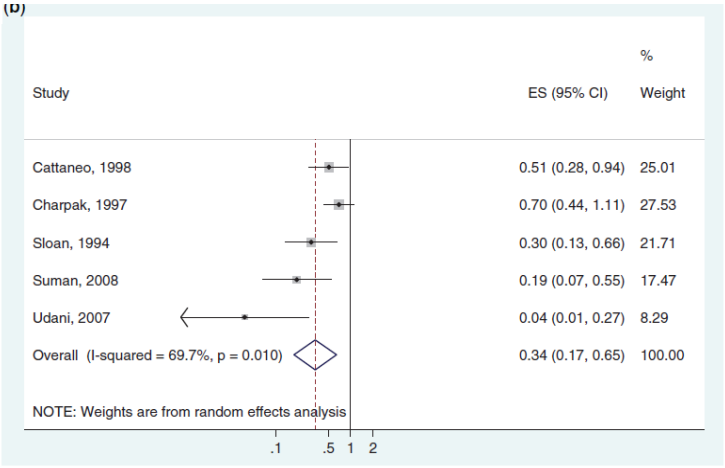

Figure 2 (**a**) Meta-analysis of three RCTs comparing KMC with standard care showing cause-specific mortality effect for babies of birth weight <2000 g (assumed to be deaths due to direct complications of preterm birth) and excluding studies where KMC was started after the first week of life. (**b**) A meta-analysis of five RCTs comparing KMC with standard care showing effect on severe morbidity (severe pneumonia, sepsis, jaundice and other severe illness) for babies of birthweight <2000 g and excluding studies where KMC was started after the first week of life. Unpublished neonatal specific data courtesy of authors, Charpak and Suman

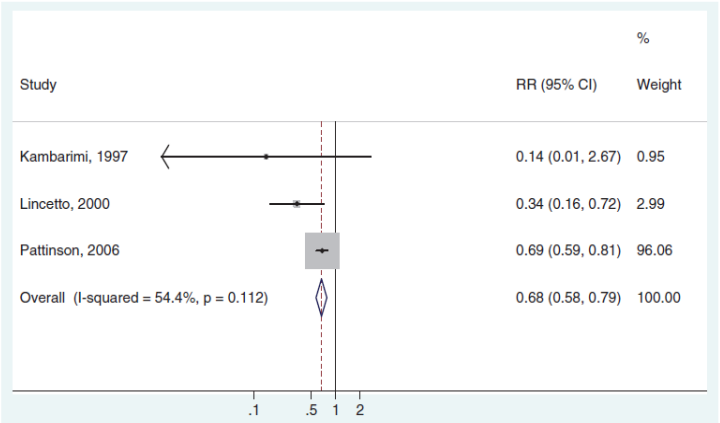

Figure 3 A meta-analysis of three observational trials comparing KMC with standard incubator care showing cause specific mortality effect for babies of birthweight <2000 g (assumed to be deaths due to direct complications of preterm birth). Pattinson data restricted to sites with comparable before/after data[27]

Conclusion This is the first published meta-analysis showing that KMC substantially reduces neonatal mortality amongst preterm babies (birth weight <2000 g) in hospital, and is highly effective in reducing severe morbidity, particularly from infection. However, KMC remains unavailable

at-scale in most low-income countries.	
Abstract **Objective.** Early mother–infant relationships in preterm populations were evaluated in the context of a systematic review of the literature. **Design and setting.** A systematic search of three electronic databases (PsychINFO, PubMed and Cochrane Library) was undertaken. Three studies of maternal attachment, 18 studies of mother–preterm infant interaction and eight studies of infant attachment were included. Studies of preterm infant attachment were also evaluated using a metaanalysis. **Results.** Studies of mother–preterm infant interactions showed that the differences in maternal interaction behavior between mothers of preterm infants and mothers of full-term infants seem to be most evident during the first six months of life. Differences in the preterm infant's interaction behavior seem also to continue for six months after birth. However, five of 18 studies showed an equal or even higher quality of mother–infant interaction in groups of preterm compared to groups of full-term infants. Studies of maternal and infant attachment indicated that preterm infants and their mothers are not at higher risk of insecure attachment than full-term infants and their mothers. **Maternal attachment is defined as a mother's emotional bond with the infant, including behavioral and emotional levels.** The quality of maternal attachment is strongly related to the mother–infant relationship (4,5). **Good-quality mother–infant interaction behavior facilitates the infant's later socio-emotional, behavioral and cognitive development and is even related to the physical health of the child**. The infant needs to experience reciprocal affective interaction with the parent to become interested in social interactions and to develop secure attachment relationships at a later age. **Based on the quality of parent–infant interaction, the child forms an attachment style during the first year of life**. The infant's attachment style directs the child's behavior in future social relations There are plenty of studies providing important insights into the development of the mother–infant relationship following a preterm birth. However, the data are inconsistent. Some of the inconsistency can be explained by the relatively recent development of family-centered neonatal care, where the parents are encouraged to be present and to be actively involved in the care of the infant. For instance, **'Kangaroo Care' is a technique applied with increasing duration at present, and infant mental health professionals are more often an integral part of the care team.** In addition, background factors may contribute to inconsistencies among the studies, as several studies have revealed differences in socioeconomic, cultural and family backgrounds between preterm infants and their controls. Furthermore, more immature preterm infants surviving today exhibit specific interaction characteristics that may affect the results of new studies on the mother–preterm infant relationship. Because of these inconsistencies in studies of the mother–preterm infant relationship, this issue should be evaluated by a systematic review.	**8. The effects of preterm birth on mother–infant interaction and attachment during the infant's first two years** **Review article** Korja R, Latva R & Lehtonen L. Acta Obstetricia et Gynecologica Scandinavica, **2012;** 91;164-173

In the present review, 29 studies covering three crucial areas of the mother–preterminfant relationship were evaluated: 1)maternal attachment, 2) mother–infant interaction and 3)infant's attachment.

Inclusion criteria for the studies

Studies of maternal attachment representations in preterm infants that met the following criteria were selected:

• Maternal attachment representations were assessed using validated semi-structured interviews based on parental

• Maternal attachment representations were assessed within two years of the infant's birth.

Studies of mother–preterminfant interaction that met the following criteria were selected:

• Mother–infant interaction was assessed using validated, objective observation methods, either from videorecordings or in observations.

• Mother–infant interaction was studied within two years of the infant's birth.

• The study design included a control group of full-term infants.

Studies of preterm infant attachment that met the following criteria were selected:

• Infant attachment was analyzed using a Strange Situation Test (12).

• Infant attachment was studied within 10–18 months of the infant's corrected age.

The studies of preterm infant attachment were evaluated further using meta-analysis. This was possible because the Strange Situation Test (12) was used in all studies and the infant's attachment was assessed within a narrow timeframe. Pooled proportion estimates and 95% confidence intervals of attachment patterns were calculated within a random effect

model framework using the metaprop function of Rmeta package (Version 0.9–19; by Guido Schwarzer) from R statistical software (R Development Core Team, www.Rproject. org).

Results

Maternal attachment representations

Three studies of maternal attachment in preterm infants were included (Korja et al 2009, Borghini et al 2006, Cox et al 2000). In all, maternal representations were analyzed using the Working Model of Child Interview coding system. In this well validated method, maternal attachment representations are divided into three groups:balanced, disengaged and distorted. Two of the studies included a control group consisting of full-term infants.

The prevalence of balancedmaternal attachment representations in preterminfants varied from30 to 68% among participants in the studies (13–15). Korja et al. (13) and Cox et al. (15) related no differences in the ratio of balanced attachment representations between mothers of preterm and full-term infants. Borghini et al. (14) reported a higher ratio of insecure (disengaged or distorted) attachment representations among the mothers of preterminfants than those of full-term infants. However, in the study by Borghini et al. (14), where the level of balanced representation was lowest, the socioeconomic status of the pretermmothers was lower than in the two other studies,which

reported a higher proportion of balanced representations (13,14). Interestingly, Borghini et al. (14) and
Korja et al. (13) indicated qualitative differences in the maternal representations between both the preterm and full-term populations. Both studies showed that themothers of preterm infants had less coherence and acceptance and more unrealistic fears for the infant's safety in their representations than did the mothers of full-term infants. Furthermore, the study by Borghini et al. (14) showed that themothers of preterminfants
had a lower level of sensitivity and involvement in their maternal representations than did the mothers of full-term infants.

Mother–infant interaction

Eighteen studies of mother–preterm infant interaction were included (17–34; Table 2). Most showed that interactional behavior and affect appeared to be different in preterm infant–mother dyads than in those between full-terminfants and their mothers. However, in five of the studies, researchers
reported no differences or an even better quality of interaction in the group of preterm infants than the full-term infants and their mothers. These inconsistent results could be caused by differences in ages and assessment methods used to evaluate different elements of interaction. Furthermore, socioeconomic backgrounds varied significantly among the
study samples. In addition, the inclusion criteria for preterm delivery varied among the studies. Overall, the studies of mother–preterm infant interaction indicated some specific interactional models that characterize
mother–preterm infant relationships.

One main finding was that mothers of preterm infants seem to have a more direct, active and controlling interaction style than mothers of full-terminfants. Schmücker et al. (20) and Minde et al. (30) showed that mothers of preterm infants talked to and looked at their infants more than mothers of full-term infants, but they touched and smiled less than mothers of full-term infants during the first three months. Furthermore, **preterm infants and their mothers have been shown to be less facially responsive and to have less eye contact during interactions than mothers and full-term infants** (17,20,26). **It has been suggested that a more vocal and active interaction style in the preterm group may compensate for the less-responsive facial interactions during the first months after the infant's birth** (30).

Studies by Crnic et al. (32) and Muller-Nix et al. (21) indicated that mothers of preterm infants were less sensitive, more controlling and more active than mothers of full-term infants during dyadic play when the infants were four and six months of age. In addition, a study by Landry et al. (27) showed that mothers of preterm infants used fewer questions to direct the infant's attention and were more straight forward in their attention-directing strategies in mother–infant interacting with their babies than mothers of full-term infants when they were at the corrected age of 12 months. Furthermore, the mothers

of preterm infants have been shown to use significantly less emotional mirroring and imitation of emotions
than mothers of full-term infants (26). Malatesta et al. (26) noted that this may be due to a negative affect in preterm infants, suggesting that it is not adaptive to imitate an infant's angry and sad emotions, especially if this precipitates even greater stress.

The other main finding in the studies of mother–preterm infant interactionwas that preterm infants are generally more passive and less alert during interactions than full-term infants. Minde et al. (30), Muller-Nix et al. (21) and Korja et al. (18) demonstrated that preterm infants were more passive, exhibited greater compulsive-compliance behaviors, sober and withdrawnmoods and a lower quality of attention, play and motor skills than full-term infants during the first three months (30) and at the corrected age of 12 (18) and 18 (20) months. These results are in line with Crnic et al. (32), Crawford (33) and Lester et al. (28). In the study by Crawford (33), preterm infants demonstrated less vocalizing and playing and were more fretful during free play mother–infant interactions than full-term infants at the corrected
age of 8, 10 and 12 months. Lester et al. (28) showed that full-term infants led the interactions more often at the corrected age of three and five months than preterm infants. Crnic et al. (32) also reported that preterm infants were more passive and less responsive in interactions at the corrected age of 4, 8 and 12 months of age. The preterm infants' passive and sober interaction behavior and affect seem to continue after
the corrected age of six months, despite the finding that the mothers' direct and controlling behavior seems to decrease after the infant reaches the corrected age of six months (20).

In contrast to the studies described earlier (19,20,24,26,30,32), Monterossi et al. (17), Korja et al. (18), Schermann-Eizirik et al. (23), and Greenberg & Crnic (25) found no differences in the quality of amother's interaction with preterm and full-term infants- during the first six months of the infant's corrected age. The studies by Crawford (33) and Greene et al. (31) demonstrated surprisingly that mothers of preterm infants exhibited more positive maternal interaction, including more responsiveness, caretaking and affectionate holding than mothers of full-term infants.

This is in line with the findings of Korja et al. (18) who reported a longer duration of affectionate holding among mothers of preterm babies compared to mothers of full-term infants.

Infant attachment

Eight studies of preterm infant attachment were included (35–42; Table 3). Four reported only very low birthweight infants (<1500g), and in the other studies, the selection criteria was birthweight <2500g. Infant attachment was assessed in all studies using the Strange Situation Test (12) and this assessment was carried out with infants with a correct age of
between 11 and 14 months. The Strange Situation Test (12) assesses infant attachment patterns and classifies them into three main

categories: 1) secure, 2) insecure avoidant, and 3) insecure resistant (43). Assessment should take place at around one year of age, when the infant has reached his or her preferred attachment style. Seven of the eight studies indicated that preterm infants were comparable in their attachment classifications to full term infants in the middle-class populations (35,36,38–42).

The study by Wille (37) included only families of low socioeconomic status and indicated more insecure attachment classifications in preterm infants (56%) than in full-term infants (17%). **The distribution of attachment patterns in the eight preterm populations was evaluated further using metaanalysis, which indicated that the pooled proportion of secure attachment classification was 64% (95% confidence intervall 0.58–0.71), insecure avoidant classification 20% (0.16–0.25), and insecure resistant classification 15% (0.10–0.22).** These proportions are comparable to those displayed by full-term infants (secure attachment in 62%, insecure-avoidant attachment in 15%, insecure-resistant attachment in 9%, and disorganized attachment in 15%) in a meta-analysis by Van Ijzendoorn et al. (44) in a normative low-risk sample (*n*=2104).

Two studies of preterm infant attachment indicated specific risk factors affecting a preterm infant's attachment patterns. Brisch et al. (35) showed that a preterm infant's significant neurological impairment was related to insecure attachment. Plunkett et al. (40) indicated that those infants who had breathing problems or spent a longer period in the Neonatal Intensive Care Unit more often demonstrated an insecure resistant attachment style than did preterm infants without breathing problems or with shorter hospitalization periods.

Results. Studies of mother–preterm infant interactions showed that the differences in maternal interaction behavior between mothers of preterm infants and mothers of full-term infants seem to be most evident during the first six months of life. Differences in the preterm infant's interaction behavior seem also to continue for six months after birth. However, five of 18 studies showed an equal or even higher quality of mother–infant interaction in groups of preterm compared to groups of full-term infants. **Studies of maternal and infant attachment indicated that preterm infants and their mothers are not at higher risk of insecure attachment than full-term infants and their mothers.**

The interaction differences among mothers with preterm and full-term infants **may be caused by maternal stress, separation and an interrupted bonding process, leading to higher intrusiveness and lower sensitivity**. The differences in maternal interaction behaviors can also be seen as an adaptive response to the preterm infant's immaturity and deficits in responsiveness. Some researchers have suggested that the average mother of a preterm infant tries to provide compensatory care for her infant, including verbalization, looking in the face, and instrumental

touch, but she does so with less affect, including less frequent smiling

and non-instrumental touching (34) **Conclusions. The mother–preterm infant relationship is complex, and some relational patterns forecast greater psychological risk than others. It is important to decrease maternal stress and early separation in every possible way during hospitalization as well as after discharge.**	
ABSTRACT Skin-to-skin contact (SSC) is a cornerstone of neurodevelopmentally supportive and family-oriented care for very low-birth-weight preterm infants (VPIs). However, performing SSC with unstable and/or ventilated VPIs remains challenging for caregiving teams and/or controversial in the literature. We first aimed to assess the safety and effectiveness of SSC with vulnerable VPIs in a neonatal intensive care unit over 12 months. Our second aim was to evaluate the impact of the respiratory support (intubation or not) and of the infant's weight (above or below 1000 g) on the effects of SSC. Vital signs, body temperature, and oxygen requirement data were prospectively recorded by each infant's nurse before (baseline), during (3 time points), and after their first or first 2 SSC episodes. We compared the variations of each parameter from baseline (analysis of variance for repeated measures with post hoc analysis when appropriate). We studied 141 SSCs in 96 VPIs of 28 (24-33) weeks' gestational age, at 12 (0-55) days of postnatal age, and at a postmenstrual age of 30.5 (± 1.5) weeks. During SSC, there were statistically significant increases in oxygen saturation (Sao_2) ($P < .001$) with decreases in oxygen requirement ($P = .043$), a decrease in heart rate toward stability ($P < .01$) but a transient and moderate decrease in mean axillary temperature following the transfer from bed to mother ($P < .05$). Apneas/bradycardias requiring minor intervention occurred in 19 (13%) SSCs, without need for SSC termination. These variations were similar for intubated newborns (18%) as compared with newborns on nasal continuous positive airway pressure (52%) or breathing room air (30%). However, ventilated infants exhibited a significant increase in transcutaneous partial pressure of carbon dioxide ($TcPco_2$) ($P = .01$), although remaining in a clinically acceptable range, and a greater decrease in oxygen requirements during SSC ($P < .001$) than nonventilated infants. Skin-to-skin contact in the neonatal intensive care unit seems safe and effective even in ventilated VPIs. Recording physiologic data of infants before, during, and after SCC provides data needed to secure changes of practice in SCC.	**9. Safety and Effectiveness of skin-to-skin Contact in the NICU to Support Neuro-development in Vulnerable Preterm Infants.** Carabasse A, Kracher S, Hausser M, Lnaglet C, Escande B, Donato L, Astruc D, Kuhn P. JPerinatol Neonat Nurs, **2013**; 27;3, 255-262

RESULTS

Study population

During the whole study period, 96 newborn infants (55 boys and 41 girls) were included, with a median (range) gestational age of 28 (24-33) weeks. The median birthweight of the study population was 1070 g (510-1972 g) and postnatal age ranged from 0 to 55 days (median, 12 days). Of the 96 infants studied, 92 had a central venous catheter in situ. This was an indwelling percutaneously inserted central venous catheter in 82 infants (85%) and an umbilical venous catheter in 10 infants (11%). Only 4 VPIs (4%) had no central venous access. A total of 17 infants (18%) were intubated and 49 infants (52%) were receiving nasal CPAP whereas 30 infants (30%) were breathing room air.

A total of 141 episodes of SSC were collected, being the first SSC for 51 VPIs and the 2 first for the remaining 45 VPIs. The mean (± SD) postmenstrual age at the time of SSC was 30.5 (± 1.6) weeks. The mean (± SD) weight at the time of SSC was 1069 g (± 285). Among all SSCs, 69 SSCs were performed in VPIs weighing less than 1000 g, and 72 SSCs were performed in VPIs with a weight of 1000 g or more at the time of SSC. Moreover, 25 SSCs were experienced by intubated infants, whereas 116 were performed in nonintubated ones (75 on nCPAP and 41 breathing room air). The mean duration (± SD) of the 141 SSCs was 71.39 (± 34.36) minutes. On the basis of calculations in the 45 infants from whom we recorded 2 SSC episodes, we observed that this mean duration (± SD) significantly increased between the first and second SSCs: 60.5 (± 31.4) minutes vs 89.7 (± 38.0) minutes; $P < .001$ (Student t test). $TcPco_2$ was only measured in 93 SSCs.

Table 1. **Means of the maximal variations relative to baseline and observed for each physiological parameter during skin-to-skin contact (n = 141 episodes in 96 VPIs)**

Parameters	Variation (ANOVA)	P (post hoc)	Average maximum variation (95% CI)
Axillary temperature (°C)	↓ $P < .001$	$P < .001$ (TP_2[a]) $P = .024$ (TP_3[a]) $P = .020$ (TP_5[a])	−0.2 (95% CI, −0.25 to −0.15) −0.07 (95% CI, −0.13 to −0.01) −0.08 (95% CI, −0.15 to −0.01)
HR (beat/min)	↓ $P = .001$	$P < .001$ (TP_2[a])	−3.5 (95% CI, −5.3 to −1.8)
RR (breath/min)	NS ($P = .13$)	...	...
Sao_2 (%)	↑ $P = .005$	$P = .025$ (TP_5[a])	+1.46 (95% CI, −0.1 to + 3.01)
$TcPco_2$ (mm Hg)	NS ($P = .46$)	...	...
Fio_2 (%)	↓ $P = .043$	$P = .020$ (TP_5[a])	−0.9% (95% CI, −0.1 to −1.8)

Abbreviations: ANOVA, analysis of variance; CI, confidence interval; Fio_2, oxygen requirement; HR, heart rate; NS, not significant; RR, respiratory rate; Sao_2, oxygen saturation; $TcPco_2$, transcutaneous partial pressure of carbon dioxide ↓, ↑, arrows indicate the direction of the observed variations, associated P values indicate statistical significance (ANOVA for repeated-measure tests).
[a] TP_2, TP_3, and TP_5 indicate the time periods (TP_2, 5 minutes after skin-to-skin contact (SSC) onset; TP_3, 30 to 60 minutes after SSC onset; and TP_5, 5 minutes after SSC termination) in which a significant variation of the parameter was found in post hoc analysis (Newman-Keuls test) as compared with baseline.

ABSTRACT

Since Kangaroo Mother Care (KMC) was developed in Colombia in the 1970s, two trends in clinical application emerged. In low income settings, the original KMC model is implemented. This consists of continuous (24 h/day, 7 days/week) and prolonged mother/parent–

10. State of the art and recommendations Kangaroo mother care: application

infant skin-to-skin contact; early discharge with the infant in the kangaroo position; (ideally) exclusive breastfeeding; and, adequate follow-up. **In affluent settings, intermittent KMC with sessions of one or a few hours skin-to-skin contact for a limited period is common.** As a result of the increasing evidence of the benefits of KMC for both infants and families in all intensive care settings, KMC in a high-tech environment was chosen as the topic for the first European Conference on KMC, and the clinical implementation of the KMC model in all types of settings was discussed at the 7th International Workshop on KMC. Kangaroo Mother Care protocols in high-tech Neonatal Intensive Care Units (NICU) should specify criteria for initiation, kangaroo position, transfer to/from KMC, transport in kangaroo position, kangaroo nutrition, parents' role, modification of the NICU environment, performance of care in KMC, and KMC in case of infant instability. **Conclusion:** Implementation of the original KMC method, with continuous skin-to-skin contact whenever possible, is recommended for application in high-tech environments, although scientific evaluation should continue. **In low income settings**, the original method with ideally 24 h/day of mother–infant skin-to-skin care (SSC) in the kangaroo position (KP) is implemented: this method is termed continuous KMC (C-KMC). In affluent settings, the method is implemented as limited sessions with mother–infant SSC in KP, such as one or a few hours, not necessarily every day, occurring over a limited period. **In affluent settings, the first component of KMC is mainly considered, i.e. skin-to-skin contact.** It is not a standard policy to offer KMC, and the extent of parent–infant exposure to KMC varies widely; **sessions lasting 1 h/day are a common pattern** (Boo et al, 2007). In one randomized controlled trial (RCT) (Ramanathan et al 2001), the **intervention group were subjected to KMC at least 4 h/day in not more than three sittings. A mean of 13.5 h/day has been reported** (Suman et al, 2010). But even periods of KMC as short as 20 min were used in one intervention study (Miles et al 2006). However, some intervention studies do not present exact data on duration or frequency of KMC sessions. **Research supporting application of C-KMC in a high-tech environment** A wide range of outcomes is addressed in studies on the effects of KMC. **Most outcome variables can be considered universal, as they apply equally to all levels of care in both low income and affluent settings.** **In high-tech NICUs,** common outcome measures in SSC studies (Bauer et al 1998, Bergman et al 2004, Ludington-Hoe et al 2003, Tornhage et al 1998) which showed improved or maintained stability, even in very preterm infants, are; infant physiological response, such as heart rate; respiration; oxygen saturation; and temperature. A Cochrane review (McCall et al 2008) concludes SSC is superior to routine measures for preventing hypothermia; however, only one study on skin-to-skin contact (Bergman et al 2004) was included in the	**in a high-tech environment** Nyqvist KH, an Expert Group of the International Network on Kangaroo Mother Care: Anderson GC, Bergman N, Cattaneo A, Charpak N, Davanzo R, Ewald U, Ludington-Hoe S, Mendoza S, Pallás-Allonso C, Peláez JG, Sizun J, Widström A-M COMMITTEE REPORT Acta Pædiatrica **2010** 99, pp. 812–819

review. Lower infant cortisol during KMC is noted (Tornhage et al 1998). During transport between hospitals, physiological parameters are stable in infants transported in KP by parents, if available, or otherwise by hospital staff with parental consent (Sontheimer et al 2004). Furthermore, KMC is efficacious in decreasing pain response in preterm and very preterm infants during painful procedures, experiences to which these infants are frequently exposed during their hospital stay (Johntson et al 2008, Johntson et al 2009, Konstandy 2008). Positive effects on infants' sleep patterns and effects that can be interpreted as improved brain maturation (Ludington-Hoe et al 2006, Scher et al 2009) and benefits for neurobehavioral and psychomotor development are observed (Tessier et al 2009, Feldman et al 2003, Feldman et al 2003).

Other common outcome variables include psychosocial aspects of parent–infant KMC, such as healing from parental crisis reactions after the birth of a preterm infant (Affonso et al 1993), and improved parent–infant interaction (Feldman et al 2003). Recovery from postpartum depression in mothers of preterm infants after early introduction of KMC is observed (de Alencar et al 2009) and mothers who practiced 1-h KMC sessions for at least 2 weeks are less stressed and perceived their preterm infants as less difficult than mothers of infants with conventional neonatal care (care without KMC) do (Tallandini et al 2006). Salivary cortisol decreases in mothers of infants born at a gestational age (GA) of 25–33 weeks and who practise KMC (Morelius et al 2005). Oxytocin release is suggested as one mediator for these effects of SSC, with short- and long-term consequences on maternal chest temperature and infant temperature, lactation and breastfeeding, maternal levels of anxiety and social competence, and mother–infant interaction (Uvnas-Moberg 2003).

In addition, a more optimal home environment is created when both mothers and fathers are involved in continuous and prolonged KMC than in the home environment of parents whose infants received conventional neonatal care (Feldman et al 2003). **Even short periods of KMC are associated with a higher breastfeeding rate, longer duration, and higher proportions of exclusive breastfeeding in hospital and during follow-up** (Hurst et al 1997, Anderson et al 2003, Hake-Brooks et al 2008, Davanzo et al 2009, Renfrew et al 2009). **Early breastfeeding competence has been observed even in very preterm infants, with capacity for nutritive sucking from 29 post-menstrual weeks, and attainment of full breastfeeding several weeks before the due date of delivery and as early as at a post-menstrual age of 32 weeks** (Nyqvist 2008). These findings support the initiation of KMC and breastfeeding without unwarranted delays: a policy that facilitates early discharge from hospital.

GUIDING PRINCIPLES AND RECOMMENDATIONS FOR KMC IN A HIGH-TECH ENVIRONMENT BY THE 7TH INTERNATIONAL WORKSHOP ON KMC AND AN INK EXPERT GROUP

Guiding principles

After the uterus, maternal / parental–infant SSC is the expected evolutionary environment for development. All intrapartum and postnatal care should adhere to a paradigm of non-separation of infants and their parents. **Kangaroo Mother Care should be used for warming, comfort, physiological and psychological benefits, growth, development, and the psychosocial needs of the family, and to promote lactation, breastfeeding initiation and longer breastfeeding duration.** Prenatally and on arrival at the unit, parents should be provided with adequate oral and written information (Table 1).

Table 1 Parent information and initiation

Parent information	*Contents:* Benefits for infant and parents, practical aspects of performance, timing of initiation, substitute KMC provider
	Timing: Ideally before delivery, both parents present; continued throughout hospitalization
Initiation of KMC	Continuous KMC from birth; exceptions – infant medical condition or parents/substitute unavailable.
GA ≥32 weeks	Initial infant assessment on mother's chest in delivery room if possible.
	Mild problems in adaptation after birth: Immediately after initial stabilization, as permitted by infant's condition and care
	Infant with CPAP: After stabilization, transport to mother for KMC with monitoring and observation (CPAP/ventilator treatment does not constitute an obstacle to KMC).
GA 28–31 weeks	Immediately after initial assessment/stabilization, as permitted by infant's medical condition and care
GA <27 weeks	During first week of life: based on individual medical assessment (weight loss, sensitivity, S-sodium)
C-section	Short period on mother's chest immediately in the operating room, if possible continued during post-op observation. Afterwards the mother is assisted with transportation to the NICU for as much KMC as possible without unjustified restrictions: father/substitute act as primary KMC provider.
	When mother is unable to visit NICU after delivery, infant can be transported to her in kangaroo position (KP) by father (accompanied by NICU staff when required to monitor the infant), or in transport incubator by NICU staff, who remain to observe and care for the infant and assist the mother in providing KP, if this is possible.
Maternal criteria	Mother unable to visit the NICU because of her own condition and care: infant transported in kangaroo position by father or in transport incubator by staff to the mother's unit for as much KMC as possible. Father acts as primary KMC provider.
Duration of session	Give infants KMC sessions that last at least 1 h.

GA = Gestational age; KMC = Kangaroo mother care; KP = Kangaroo position.
Father includes partner and substitute designated as kangaroo mother care provider by the family.

The KP is the preferred routine place for care, beginning at birth, taking into consideration the physiological and behavioral state of the infant and parent; it is possible that KMC may contribute to the infant's stabilization. Removal from this place of care should be for specific reasons only. For infants born at a gestational age of 27 weeks or less, decisions about the initiation and timing of KMC sessions during the first week of life should be based on individual medical assessment (Agren et al 1998,2006, Chiou 2004).

Mothers / parents should be offered adequate support for physical, social and mental wellbeing. Kangaroo Mother Care should be used for transfer of the infant to the neonatal unit after birth (when appropriate), within the hospital, and between hospitals: this should be carried out with portable equipment for cardio-respiratory monitoring, assisted ventilation and other required medical technical support (Table 2) Visiting regulations should accommodate 24/7 KMC, in that there should be no restrictions for parents' presence or for persons designated as KMC surrogates by the parents (Table 3). If economic restrictions and social policies create obstacles for allowing parents to stay as much as they wish with their infants, interventions should be implemented for optimal changes, including advocacy for maternity leave policies allowing parents to provide KMC. The physical environment should be adapted as far as possible for parents' and infants' maximum relaxation and comfort (depending on available economic resources). Parents should be involved in the infant's care soon after birth, and coached to take over the infant's care before the infant is discharged from hospital (Nyqvist et al 2009). During KMC, monitoring, nursing and medical care is

provided according to current standards, with the infant's place of care as the only difference (Table 4). For unstable infants, decisions about KMC sessions are based on ongoing physiological assessment. If instability occurs during KMC, relevant nursing and medical measures should be taken with the infant remaining in KP, and KP should only be discontinued when these measures do not produce the expected improvement: adjusting the infant's kangaroo position and ascertaining maximum infant–parent KMC is a primary activity to undertake and evaluate. Primary responsibilities include monitoring the maintenance of the correct kangaroo position for safety and the maximum KMC for effectiveness. Kangaroo Mother Care may be used during terminal care in agreement with parents (Collins 1993, Parker et al 2002).	
ABSTRACT **Aim:** To determine if clinically stable extremely preterm infants can maintain their temperature during skin-to-skin contact and to screen for other negative effects. **Methods:** Continuous measurement of 22 stable infants' physical parameters 2 h before, during, and 2 h after skin-to-skin-contact. Mean gestational age at birth was 25 weeks and 4 days, mean post-natal age was 8 days, postmenstrual age was 26 weeks and 6 days, and mean actual weight 702 g. Mean duration of skin-to-skin-contact was 98 min. 16 infants were skin-to-skin with the mother, five with the father and one with an older sister. **Results:** There were no significant differences in mean skin temperature, heart rate, respiration rate, or oxygen saturation before, during, and after skin-to-skin contact. While staying within normal range, the mean skin temperature increased 0.1∘C during skin-to-skin contact with the mother and decreased 0.3∘C during skin-to-skin contact with the father (p = 0.011) (without post-hoc correction). **Table 1** Study group (n = 22) Mean (range) Gestational age, weeks + days: 25 + 4 (23 + 6–27 + 0) Postmenstrual age at test, weeks + days: 26 + 5 (25 + 1–27 + 6) Birth weight (g): 735 (460–1050) Weight at test (g): 702 (435–900) Postnatal age at test (days): 8 (1–27) Duration of skin-to-skin contact (min): 98 (51–387) Incubator temperature at pre-test, (°C): 34.1 (29.3–37.5) Incubator humidity at pre-test (%): 63 (30–84) **Table 2** Physical parameters (n = 22) Pretest mean (±SD) / Test mean (±SD) / Posttest mean (±SD) Mean skin temperature (°C): 37.1 (±0.33) / 37 (±0.40) / 37.1 (±0.28) Heart rate (bpm): 160 (±11) / 160 (±12) / 161 (±14) Respiration rate (per min): 47 (±7) / 47 (±6) / 48 (±8) Oxygen saturation (%): 95 (±3) / 96 (±2) / 95 (±3) FiO_2: 0.25 (±0.06) / 0.24 (±0.05) / 0.24 (±0.06) Stimulation required apnoeas in total: 12 / 5 / 6 **Conclusion:** Clinically stable, extremely preterm infants can keep adequate skin temperature and adequate physical stability and stay stable during and after skin-to-skin contact with there parents.	**11. Extremely preterm infants tolerate skin-to-skin contact during the first weeks of life** Maastrup R., Greisen G Acta Paediatrica **2010**;99;1145-1149

Abstract

OBJECTIVE: To investigate the impact of early skin-to-skin contact (SSC) provided for first 24 h on incidence of hypothermia in stable newborns weighing 1800 g or more during first 48 h of life.

STUDY DESIGN: Stable newborns (term and late preterm: Mean gestational age 37.7 (1.35) weeks, range 34–40 weeks) having birth weight 1800 g or more (Mean weight 2605.6 (419.8) grams) were enrolled after approval from Institutional Human Research Ethics Committee (CTRI/2013/06/003790) and randomized into early SSC (intervention group) and conventional care (control group). Initial care in the delivery room for few minutes immediately after birth in both the groups was given under radiant warmer. In the intervention group, newborns were provided SSC by their mother started between 30 min and 1 h after birth for first 24 h with minimal interruption and were provided conventional care other than SSC for next 24 h of life. In the control group, newborns were kept with their mother and received conventional care other than SSC for first 48 h. Temperature and heart rate of newborns were recorded at 30 min, 1, 2, 3, 4, 5, 6, 12, 24 and at 48 h of life in both the groups. Independent Samples t-Test and relative risk were used to analyze the data.

RESULT: Both groups had 50 neonates each with similar baseline characteristics. Heart rates were in normal range in both the groups. The intervention group provided an average (s.d.) of 16.98 (0.28) h of SSC over the first 24 h period. The mean temperature was significantly high in the SSC group at all time intervals starting from 1 to 48 h (Po0.05 for all). In the SSC group only two newborns (4%) had mild hypothermia (cold stress), and, of these two newborns, one had two episodes of hypothermia. All these three episodes of hypothermia occurred within first 3 h of life. In the control group 16 newborns (32%) developed hypothermia (temperature 36.5 o C) during first 48 h of life. Of them, 11 newborns had single episode, 4 newborns had two episodes and one
newborn had three episodes of hypothermia. Of these 22 hypothermic episodes, 20 occurred in the first 6 h of life and 2 episodes occurred at 48 h of life. Moderate hypothermia was seen in two newborns, whereas rest had mild hypothermia. The relative risk of developing hypothermia in the control group as compared with the SSC group was 8.00 (95% CI 1.94–32.99). There was no seasonal variation in incidence of hypothermia in both the groups.

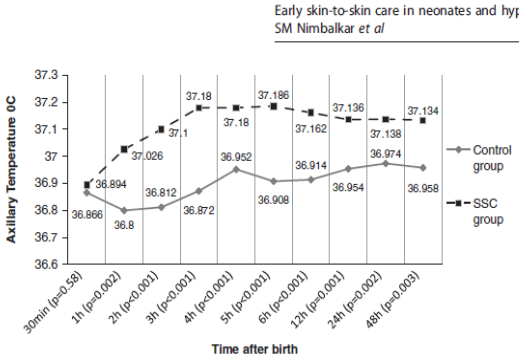

Figure 2. Mean temperature at various time intervals after birth in both the groups. *P*-value suggests difference between means of two groups at respective time.

12. Effect of early skin-to-skin contact following normal delivery on incidence of hypothermia in neonates more than 1800 g: randomized control trial

SM Nimbalkar, VK Patel, DV Patel, AS Nimbalkar, A Sethi and A Phatak

Journal of Perinatology, **2014;** 34;364–368

CONCLUSION: Newborns in the SSC group achieved rapid thermal control as compared with the control group. Early SSC for 24 h after birth decreases incidence of hypothermia for initial 48 h of life. Early SSC needs to be aggressively promoted in term and late preterm newborns to reduce incidence of hypothermia.

ABSTRACT

BACKGROUND. Sleep is important to brain organization, but few strategies to promote sleep among premature infants have been tested. Behaviorally based measures of sleep have shown increased quiet sleep (QS) and decreased active sleep (AS) during skin-to-skin contact (SSC) with the mother, but these results have not been confirmed with objective electroencephalographic/polysomnographic measures of sleep organization. Important differences exist between behavioral and electroencephalographic/polysomnographic definitions of sleep state. **Subjects** Seventyone premature infants were recruited, data for 28 have been analyzed to date, with 14 in SSC group and14 in the control group. before PMA of 32 weeks, the infant had no encephalopathy, intraventricular hemorrhage of more than grade II, white matter lucencies on cranial ultrasound scans, seizures, meningitis, or congenital brain malformations. Subjects whose 5-minute Apgar scores were >6, whose gestational age was ≥28 weeks, and whose testing weight was >1000 g were included. Each infant was fed every 2 or 3 hours through bolus gavage or orally and experienced no painful procedures or sedative medication within 12 hours before testing.

TABLE 2 Characteristics of the Subjects ($N = 28$)

Variable	SSC Group ($n = 14$)	Control Group ($n = 14$)
Room, no.		
NICU	7	7
Step-down	7	7
Bed, no.		
Incubator	10	11
Open-air crib	4	3
Feeding schedule, no.		
2-h	7	4
3-h	7	10
Gender, no.		
Female	10	8
Male	4	6
History of apnea/bradycardia, no.		
No	7	7
Yes	7	7
Caffeine on day of study, no.		
No	10	9
Yes	4	5
Gestational age, mean ± SD, wk	30.8 ± 1.4	30.8 ± 1.1
Birth weight, mean ± SD, g	1457 ± 325	1532 ± 241
PMA at time of study, mean ± SD, wk	32.4 ± 0.9	32.5 ± 0.9
Study weight, mean ± SD, g	1487 ± 175	1573 ± 175
Age at time of study, mean ± SD, d	11.6 ± 5.1	12.0 ± 12.0
Neurobiologic Risk Scale score, mean ± SD	0.29 ± 0.47	0.36 ± 0.50
Score of 0, no.	10	9
Score of 1, no.	4	5

METHODS. Data for the first 28 relatively healthy, preterm subjects of an ongoing randomized trial of one 2- to 3-hour session of SSC or incubator care between feedings are reported here. Infants were positioned prone, inclined, and nested in an incubator during the 2- to 3-hour pretest period, were fed, and then went into he test period of SSC or incubator care. Infants were left largely undisturbed throughout testing. A mixed-model regression analysis compared the test-pretest differences in outcome measures within and between groups.

13. Neurophysiologic Assessment of Neonatal Sleep Organization: Preliminary Results of a Randomized, Controlled Trial of Skin Contact With Preterm Infants

Susan M. Ludington-Hoe, , Mark WJ, Morgan K, Lewis T, Gutman J, Wilson Mark SS

PEDIATRICS 117, 5, **2006**

RESULTS. Results showed that arousals were significantly lower in the SSC group, compared with the control group, for the entire study period and for test-pretest matched segments of quiet sleep and active sleep. **Rapid eye movement was significantly lower for the SSC group for the study period and active sleep segments.** Indeterminate sleep was significantly lower for the SSC group when confounding environmental variables were included in the regression analysis. When 4 subjects who experienced excessive ambient light levels during SSC were removed from analysis, quiet increased during SSC. **CONCLUSIONS. The patterns demonstrated by the SSC group are analogous to moremature sleep organization. SSC may be used as an intervention to improve sleep organization in this population of preterm infants.**	
ABSTRACT **BACKGROUND,OBJECTIVE:** The "synactive" theory of neurobehavioral development forms the basis of the Newborn Individualized Developmental Care and Assessment Program (NIDCAP). Our objective was to assess the effectiveness of NIDCAP in improving outcomes in preterm infants. **METHODS:** Medline, CINAHL, Embase, PsychInfo, The Cochrane Library, Pediatric Academic Societies' Abstracts and Web of Science were searched in July 2010 and February 2012. The studies selected were randomized controlled trials testing the effectiveness of NIDCAP on medical and neurodevelopmental outcomes. The authors abstracted baseline characteristics of infants and outcomes. The risk of bias was assessed by using Cochrane criteria. RevMan 5.1 was used to synthesize data by the use of relative risk and risk difference for dichotomous outcomes and mean or standardized mean difference for continuous outcomes. **RESULTS: Eleven primary and 7 secondary (follow-up) studies enrolling 627 neonates were included, with 2 of high quality. The composite primary outcomes of death or major sensorineural disability at 18 months corrected age or later in childhood** (3 trials, 302 children; relative risk 0.89 [95% confidence interval 0.61 to 1.29]) **and survival free of disability at 18 months corrected age or later in childhood** (2 trials, 192 infants; relative risk 0.97 [95% confidence interval 0.69 to 1.35]), **were not significantly different between the NIDCAP and control groups. With the sensitivity analysis that excluded the 2 statistically heterogeneous outlying studies, there were no significant differences between groups for short-term medical outcomes.**	**14. NIDCAP: A Systematic Review and Meta-analyses of Randomized Controlled Trials** Ohlsson A, Jacobs SE PEDIATRICS Vol 131;3;**2013**

TABLE 1 Primary and Secondary Long-term Neurosensory Outcomes at 18 Months CA or Later

Outcome	No. of Studies	Source	No. of Infants Reported on	Statistic	Results (95% CI) [I^2]
Primary outcomes					
Death or major sensorineural disability	3	Maguire 2009[38] Peters 2009[30] Westrup 2000[25] Westrup 2004[37]	302	Relative risk	0.89 (0.61 to 1.29) [79%]
Survival free of any disability	2	Maguire 2009[38] Westrup 2000[25] Westrup 2004[37]	192	Relative risk	0.97 (0.69 to 1.35) [0%]
Secondary outcomes					
Visual impairment	2	Peters 2009[30] Westrup 2000[25] Westrup 2004[37]	127	Relative risk	4.0 (0.18 to 89.95) (heterogeneity not applicable, because there were no cases in either group in the study by Peters 2009)
Sensorineural hearing loss	3	Als 1994[19] McAnulty 2010[33] Peters 2009[30] Westrup 2000[25] Westrup 2004[37]	149	Relative risk	0.61 (0.14 to 2.65) [0%]
Cerebral palsy	3	Als 1994[19] McAnulty 2010[33] Peters 2009[30] Westrup 2000[25] Westrup 2004[37]	149	Relative risk	0.22 (0.04 to 1.21 [0%]

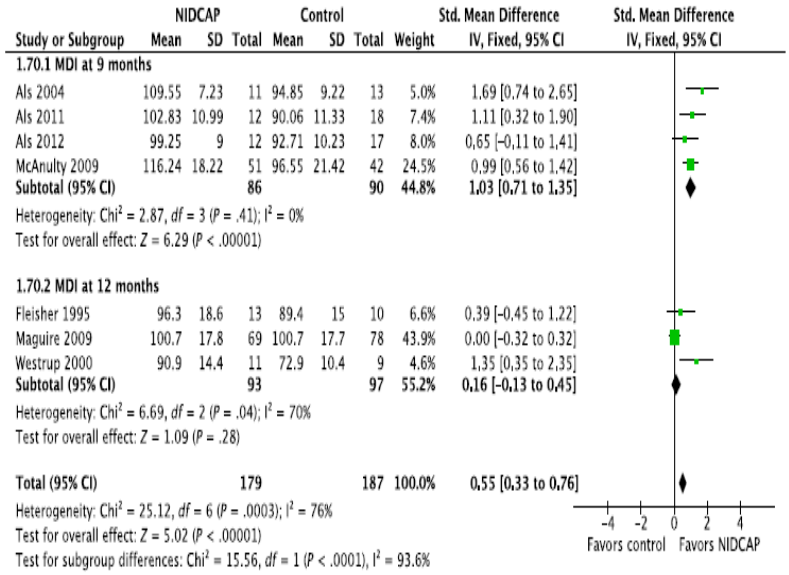

FIGURE 3
Bayley scales of infant development: mental development index at 9 or 12 months corrected age.

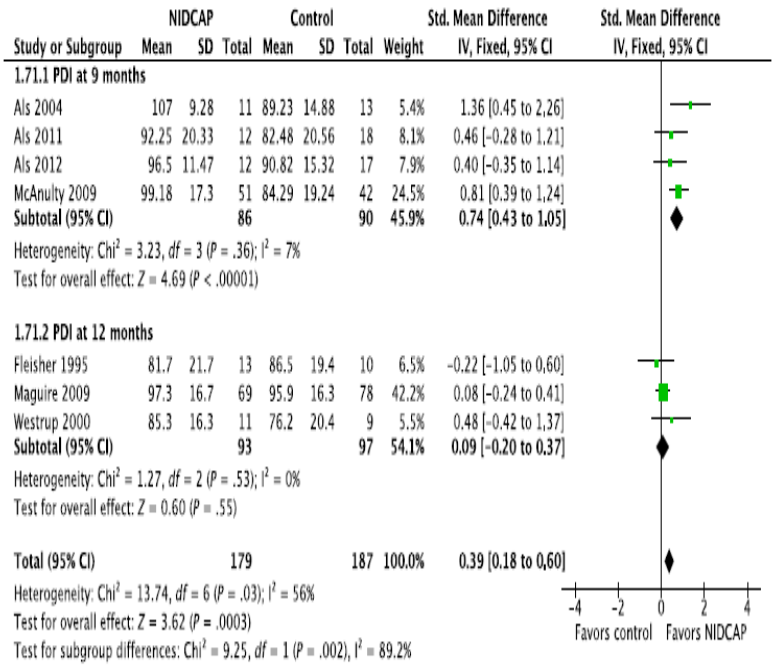

FIGURE 4

Bayley scales of infant development: psychomotor development index at 9 or 12 months corrected age.

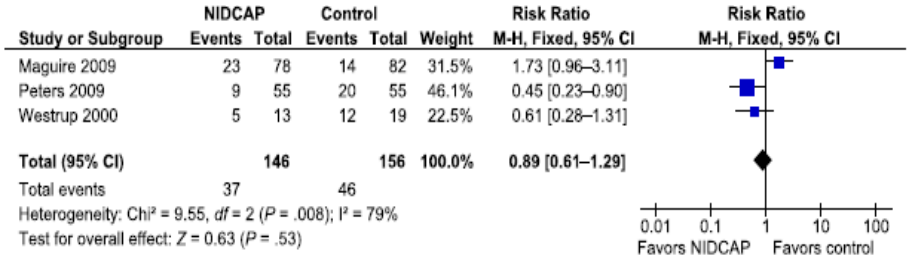

FIGURE 2

Death or disability at 18 months CA or later in childhood. M-H, Mantel-Haenszel.

TABLE 2 Neurodevelopmental Outcomes From 4 Months to 8 Years CA

Outcome	No. of Studies	Source	No. of Infants Reported on	Statistic	Results (95% CI)[I^2]
MDI at 4 mo CA	1	Fleisher 1995[24] Ariagno[34]	22	Mean difference	−1.90 (−14.69 to 10.89) [heterogeneity not applicable]
PDI at 4 mo CA	1	Fleisher 1995[24] Ariagno[34]	22	Mean difference	3.80 (−11.06 to 18.66) [heterogeneity not applicable]
MDI at 9 or 12 mo CA	7	Als 2004[27] Als 2011[31] Als 2012[32] McAnulty 2009[28] Fleisher 1995[24] Ariagno[34] Maguire 2009[38] Westrup 2000[25] Kleberg[35]	366	Standardized mean difference	0.55 (0.33 to 0.76) [76%][a]
PDI at 9 or 12 mo CA	7	Als 2004[27] Als 2011[31] Als 2012[32] McAnulty 2009[28] Fleisher 1995[24] Ariagno[34] Maguire 2009[38] Westrup 2000[25] Kleberg[35]	366	Standardized mean difference	0.39 (0.18 to 0.60) [56%][a]
MDI at 18 or 24 mo CA	3	Peters 2009[30] Fleisher 1995[24] Ariagno[34] Maguire 2009[38]	263	Standardized mean difference	0.19 (−0.06 to 0.43) [5%]
PDI at 18 or 24 mo CA	3	Peters 2009[30] Fleisher 1995[24] Ariagno[34]	263	Standardized mean difference	−0.00 (−0.25 to 0.24) [30%]

		Maguire 2009[30]			
Full-scale IQ at 5.5 (WPPSI-R) or 8 (WISC-R) y CA	2	Westrup 2000[25] Westrup[37] Als 1994[19] McAnulty[33]	48	Standardized mean difference	0.21 (−0.37 to 0.78) [0%]
Verbal IQ at 5.5 (WPPSI-R) or 8 (WISC-R) y CA	2	Westrup 2000[25] Westrup[37] Als 1994[19] McAnulty[33]	48	Standardized mean difference	−0.06 (−0.63 to 0.51) [0%]
Performance IQ 5.5 (WPPSI-R) or 8 (WISC-R) y CA	2	Westrup 2000[25] Westrup[37] Als 1994[19] McAnulty[33]	48	Standardized mean difference	0.53 (−0.06 to 1.11) [0%]

[a] Indicates statistically significant finding.

TABLE 3 Short-term Medical Outcomes

Outcome	No. of Studies	Source	No. of Infants Enrolled or No. of Infants for Which the Outcome Is Reported	Statistic	Results (95% CI) [I^2]
Mortality (in hospital)	4	Fleisher 1995[24] Maguire 2009[29] Peters 2009[30] Westrup 2000[25]	354	Risk ratio	1.58 (0.79 to 3.16) [0%]
CLD at 36 wk PMA	4	Fleisher 1995[24] Maguire 2009[29] Peters 2009[30] Westrup 2000[25]	329	Risk ratio	0.81 (0.57 to 1.16) [79%]
IVH: all grades	10	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Buehler 1995[23] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28] Peters 2009[30] Westrup 2000[25]	581	Risk ratio	0.83 (0.64 to 1.07) [16%]
IVH grade III/IV	10	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Buehler 1995[23] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28] Peters 2009[30] Westrup 2000[25]	581	Risk ratio	0.90 (0.55 to 1.47) [0%]
Sepsis	4	Fleisher 1995[24] Maguire 2009[29] Peters 2009[30] Westrup 2000[25]	335	Risk ratio	0.89 (0.72 to 1.09) [0%]
ROP all stages	7	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28]	400	Risk ratio	0.89 (0.71 to 1.10) [0%]
ROP ≥ stage III	8	Als 2004[27] Als CHB 2003[26] Als CHO 2003[26] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28] Peters 2009[30] Westrup 2000[25]	502	Risk ratio	0.73 (0.46 to 1.14) [0%]
NEC	6	Als BWH 2003[26] Als CHB 2003[26] Als CHO 2003[26] Buehler 1995[23] Fleisher 1995[24] Maguire 2009[29]	315	Risk ratio	0.46 (0.18 to 1.16) [0%]
Supplemental oxygen, d	7	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Maguire 2009[29] McAnulty 2009[28] Peters 2009[30]	503	Mean difference	−0.37 (−4.76 to 4.02) [35%]

TABLE 3 Continued

Outcome	No. of Studies	Source	No. of Infants Enrolled or No. of Infants for Which the Outcome Is Reported	Statistic	Results (95% CI) [I^2]
Assisted ventilation via an endotracheal tube, d	8	Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28] Peters 2009[30] Westrup 2000[25]	457	Mean difference	−1.9 d (−4 to 0.3) [63%]
Length of hospitalization, d	9	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Buehler 1995[23] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28] Peter 2009[30]	536	Mean difference	−6 d (−11 to −1.5)[a] [57%]
PMA at discharge, wk	10	Als 2004[27] Als 2011[31] Als CHO 2003[26] Als CHB 2003[26] Buehler 1995[23] Fleisher 1995[24] Maguire 2009[29] McAnulty 2009[28] Peters 2009[30] Westrup 2000[25]	566	Mean difference	−0.51 wk (−1.02 to −0.00) $P = .04$[a] [50%]

IVH, intraventricular hemorrhage; ROP, retinopathy of prematurity; NEC, necrotizing enterocolitis.
[a] Indicates statistically significant finding.

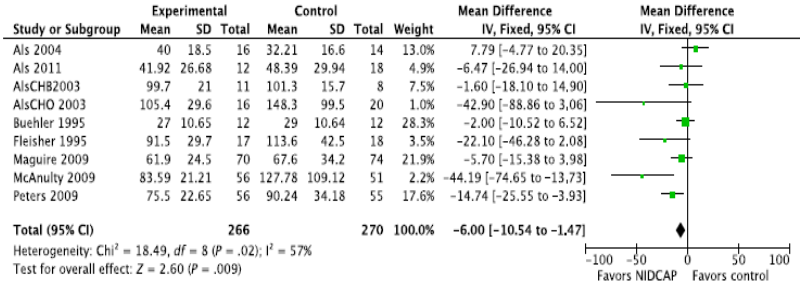

FIGURE 5
Length of hospitalization (days).

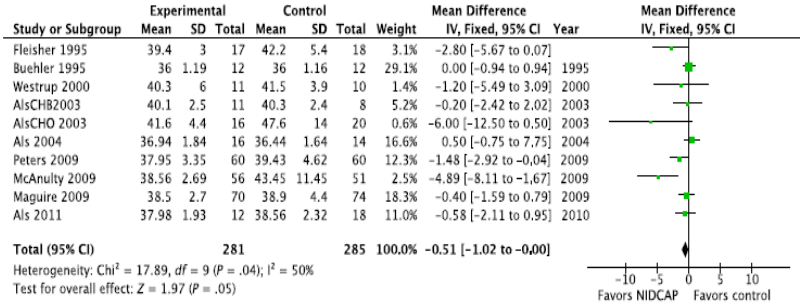

FIGURE 6
Postmenstrual age (weeks) at discharge from the hospital.

Table 4 Growth

Outcome	No. of Studies	Source	No. of Infants Reported on	Statistic	Results (95% CI) [I^2]
Head circumference at term or 2 wk CA (cm)	6	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Maguire 2009[29] McAnulty 2009[28]	371	Weighted mean difference	0.08 (−0.24 to 0.40) [44%]
Head circumference at 9 mo CA (cm)	2	Als 2004[27] Als 2011[31]	60	Weighted mean difference	0.09 (−0.61 to 0.79) [55%]
Head circumference at 1 y CA (cm)	1	Maguire 2009[30]	148	Mean difference	−0.40 (−1.00 to 0.20) (heterogeneity not applicable)
Head circumference at 2 y CA (cm)	1	Maguire 2009[30]	143	Mean difference	−0.30 (−0.87 to 0.27) (heterogeneity not applicable)
Daily weight gain (g/d)	6	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Maguire 2009[29] McAnulty 2009[28]	374	Weighted mean difference	1.46 (0.30 to 2.63) [33%][a]
Weight at term or 2 wk CA (g)	6	Als 2004[27] Als 2011[31] Als CHB 2003[26] Als CHO 2003[26] Maguire 2009[29] McAnulty 2009[28]	374	Weighted mean difference	89.23 (−30.26 to 208.72) [33%]
Weight at 9 mo CA (g)	2	Als 2004[27] Als 2011[31]	60	Weighted mean difference	−247.31 (−841.72 to 347.11) [0%]
Weight at 1 y CA (g)	1	Maguire 2009[30]	148	Mean difference	−0.18 (−0.60 to 0.24) (heterogeneity not applicable)
Weight at 2 y CA (g)	1	Maguire 2009[30]	141	Mean difference	−0.30 (−0.87 to 0.27) (heterogeneity not applicable)

[a] Indicates statistically significant finding.

CONCLUSIONS: This systematic review including 627 preterm infants did not find any evidence that NIDCAP improves long-term neurodevelopmental or short-term medical outcomes.

Abstract

Background the risks for long-term adverse neurodevelopmental and behavioral outcomes remain unacceptably high. These include attention deficits [Johnson et al 2011], executive dysfunction [Peterson et al 2000, Baron et al 2012], depression and psychotic disorders [Nosarti et al 2012], and autism spectrum disorder [Pinto-Martin et al 2011].

Accordingly, there have been increasing calls for novel evidence-based interventions that can that can limit or overcome long-term developmental morbidities that accompany preterm birth [Moore et al 2012,Sizun et al 2004], as well as for more rigorous randomized controlled trials (RCTs) to validate the results [Symington et al 2006]. In addition to several new pharmaceutical and medical interventions, there have been many interventions aimed at improving outcomes for the infant through enrichment of the infant's NICU environment, including increased parent involvement in infant care [Brett et al 2011]. The best studied of these latter approaches are Newborn Developmental Care and Assessment Program (NIDCAP) [Als et al 1994, Als et al 2012], skin-to-skin care [Feldman et al 2002, Conde-Agudelo et al 2011], and massage therapy [Feld et al 2006, Feld et al 2010, Vickers et al 2004].

FNI focuses on the mother and infant as a dyad and therefore seeks to positively effect a change in the co-regulatory relationship between infant and mother. FNI does this by facilitating affective communication and an emotional connection between the two. It does so in the very early stages of NICU care when infants are confined to the incubator by using scent cloth exchange, sustained touch, vocal soothing and eye contact. At later stages, when the infants are stable and can remain outside the incubator, FNI facilitates wrapped or skin-to-skin holding and as much

15. Randomized controlled trial of Family Nurture Intervention in the NICU: assessments of length of stay, feasibility and safety

Welch MG, Hofer MA, Stark RI, Andrews HF, Austin J, Glickstein SB, Ludwig RJ Myers MM and the FIN trial Group

BMC Pediatrics **2013,** 13:148

engagement of mothers in daily infant care as possible. Throughout the hospitalization,

FNI facilitates family-based support for mother-infant interactions.

Abstract

Background: While survival rates for preterm infants have increased, the risk for adverse long-term neurodevelopmental and behavioral outcomes remains very high. In response to the need for novel, evidence-based interventions that prevent such outcomes, we have assessed Family Nurture Intervention (FNI), a novel dual mother-infant intervention
implemented while the infant is in the Neonatal Intensive Care Unit (NICU). Here, we report the first trial results, including the primary outcome measure, length of stay in the NICU and, the feasibility and safety of its implementation in a high acuity level IV NICU.

Methods: The FNI trial is a single center, parallel-group, randomized controlled trial at Morgan Stanley Children's Hospital for mothers and their singleton or twin infants of 26–34 weeks gestation. Families were randomized to standard care (SC) or (FNI). FNI was implemented by nurture specialists trained to facilitate affective communication between mother and infant during specified calming interactions. These interactions included scent cloth exchange, sustained touch, vocal soothing and eye contact, wrapped or skin-to-skin holding, plus family-based support interactions.

Results: A total of 826 infants born between 26 and 34 weeks during the 3.5 year study period were admitted to the NICU. After infant and mother screening plus exclusion due to circumstances that prevented the family from participating, 373 infants were eligible for the study. Of these, we were unable to schedule a consent meeting with 56, and consent was withheld by 165. Consent was obtained for 150 infants from 115 families. The infants were block randomized to groups of N = 78, FNI and N = 72, SC. Sixteen (9.6%) of the randomized infants did not complete the
study to home discharge, 7% of those randomized to SC and 12% of FNI infants. Mothers in the intervention group engaged in 3 to 4 facilitated one- to two-hour sessions/week. Intent to treat analyses revealed no significant difference between groups in medical complications. The mean length of stay was not significantly affected by the intervention.

Safety of the intervention was determined by examining specific clinical characteristics of infants during hospitalization and at discharge (Table 1).

Table 1 Clinical characteristics of infants during hospitalization and at discharge: N = 134 infants who completed the study

	SC N = 67	FNI N = 67		
	n (%)	n (%)	χ^2	p
During NICU stay				
Antibiotics to rule out sepsis	40 (59.7)	43 (64.2)	.285	.594
Treated for presumed sepsis	7 (10.4)	9 (13.4)	.284	.594
Confirmed sepsis	11 (16.4)	7 (10.4)	1.027	.311
Medical treatment for NEC	4 (6.0)	7 (10.4)	.891	.345
Surgical treatment for NEC	2 (3.0)	0 (0.0)	*	.496
Caffeine	9 (13.4)	7 (10.4)	.284	.594
Intra-ventricular hemorrhage	17 (25.4)	14 (20.9)	.378	.539
Hydrocephalus	2 (3.0)	0 (0.0)	*	.496
Seizures diagnosed	1 (1.5)	0 (0.0)	*	1.00
Treatment for seizures	1 (1.5)	0 (0.0)	*	1.00
Cardiology †	7 (10.4)	7 (10.4)	0.000	1.00
Retinopathy of prematurity: diagnosis	6 (9.0)	7 (10.4)	.085	.770
Retinopathy of prematurity: surgery	1 (1.5)	0 (0.0)	*	1.00
Feeding problems	15 (22.4)	7 (10.4)	3.481	.062
At discharge				
Nasal oxygen	2 (3.0)	0 (0)	*	.496
Other medications	16 (23.9)	12 (17.9)	.722	.395
	mean ± SD	mean ± SD	t	p
Weight (grams)	2596 (748)	2521 (565)	.655	.513

**Fisher's exact test.*

† 4 Atrial septal defects; 2 ventricular septal defects; 5 patent foramen ovale; 1 ventricular dilatation; 1 dysplastic pulmonary valve; 1 biventricular dilatation.

Abbreviations: NEC Necrotizing enterocolitis.

Table 2 Demographic characteristics of 115 families randomized for study

Family characteristics	SC N = 56	FNI N = 59
	Mean ± SD	Mean ± SD
Mothers' age (years)	32.8 (5.69)	34.1 (6.11)
Fathers' age (years)	34.9 (6.49)	37.3 (8.09)
	n (%)	n (%)
Married	39 (69.6)	41 (69.5)
Mothers' ethnicity		
Black	13 (23.2)	13 (22.0)
Hispanic	14 (25.0)	17 (28.8)
White	24 (42.9)	24 (40.7)
Other	5 (8.9)	5 (8.5)
Fathers' ethnicity		
Black	15 (26.8)	12 (20.3)
Hispanic	12 (21.4)	15 (25.4)
White	21 (37.5)	28 (47.5)
Other	8 (14.3)	4 (6.8)
Mothers' education		
High school or lower	6 (10.7)	7 (11.9)
Some college	15 (26.8)	12 (20.3)
Graduate or higher	35 (62.5)	40 (67.8)
Fathers' education		
High school or lower	14 (25.0)	13 (22.0)
Some college	11 (19.6)	12 (20.3)
Graduate or higher	31 (55.4)	34 (57.6)
Family income		
< $40,000	13 (23.2)	10 (16.9)
$40,000 - $70,000	3 (5.4)	13 (22.1)
> $70,000	34 (60.7)	31 (52.5)
Did not report	6 (10.7)	5 (8.5)

Table 3 Baseline clinical characteristics: N = 115 mothers of N = 150 infants

Baseline characteristics		SC N = 56	FNI N = 59
Maternal		**n (%)**	**n (%)**
Preeclampsia		17 (30.4)	23 (39.0)
HELLP syndrome		3 (5.4)	4 (6.8)
Hypertension		10 (17.9)	9 (15.3)
Diabetes		9 (16.1)	13 (22.0)
Steroids		52 (92.9)	55 (93.2)
Tocolytic drugs		47 (83.9)	47 (79.7)
Cesarean delivery		35 (62.5)	43 (72.9)
		SC N = 72	**FNI N = 78**
Infant		**mean ± SD**	**mean ± SD**
Gestational age (wk)		30.7 (2.6)	30.8 (2.1)
Birth weight (g)		1474 (439)	1426 (396)
Length at birth (cm)		39.6 (4.2)	39.7 (3.4)
Head circumference at birth (cm)		28.1 (3.0)	28.2 (3.0)
		n (%)	**n (%)**
Male		36 (50.0)	41 (52.6)
Singleton		40 (55.6)	39 (50.0)
Cesarean delivery		48 (66.7)	62 (79.5)
Resuscitated at birth		18 (26.5)	21 (29.2)
Placed on CPAP at delivery		67 (94.4)	67 (90.5)
Placed on CPAP at delivery		67 (94.4)	67 (90.5)
Apgar scores	≥7 at 1 minute	57 (79.2)	54 (69.2)
	≥4 at 1 minute	66 (91.7)	69 (88.5)
	≥7 at 5 minutes	68 (94.4)	72 (92.3)
	≥4 at 5 minutes	71 (98.6)	74 (94.9)

Abbreviations: CPAP Continuous positive airway pressure, *HELLP* syndrome Hemolysis, elevated liver enzymes, low platelet count.

Conclusion: There was no significant effect demonstrated with this intervention amount on the primary short-term outcome, length of stay. FNI can be safely and feasibly implemented within a level IV NICU.

Background: Preterm infants are at high risk for adverse neurodevelopmental and behavioral outcomes. Family Nurture Intervention (FNI) in the Neonatal Intensive Care Unit (NICU) is designed to counteract adverse effects of separation of mothers and their preterm infants. Here, we evaluate effects of FNI on neurobehavioral outcomes.
Methods: Data were collected at 18 months corrected age from preterm infants. Infants were assigned at birth to FNI or standard care (SC). Bayley Scales of Infant Development III (Bayley-III) were assessed for 76 infants (SC, n = 31; FNI, n = 45); the Child Behavior Checklist (CBCL) for 57 infants (SC, n = 31; FNI, n = 26); and the Modified Checklist for Autism in Toddlers (M-CHAT) was obtained for 59 infants (SC, n = 33; FNI, n = 26).
Results: Family Nurture Intervention significantly improved Bayley-III cognitive ($p = .039$) and language ($p = .008$) scores for infants whose scores were greater than 85. FNI infants had fewer attention problems on the CBCL ($p < .02$). FNI improved total M-CHAT scores ($p < .02$). Seventy-six percent of SC infants failed at least one of the M-CHAT items, compared to 27% of FNI infants ($p < .001$). In addition, 36% of SC infants versus 0% of FNI infants failed at least one social-

16. Family Nurture Intervention in the Neonatal Intensive Care Unit improves social-relatedness, attention, and neurodevelopment of preterm infants at 18 months in a randomized controlled trial

Welch MG, Morgan RF, Austin J, Hane AA, Stark RI, Hofer MA, Garland M, Glickstein SB,

relatedness M-CHAT item ($p < .001$). **Conclusions: Family Nurture Intervention is the first NICU intervention to show significant improvements in preterm infants across multiple domains of neurodevelopment, social-relatedness, and attention problems. These gains suggest that an intervention that facilitates emotional interactions between mothers and infants in the NICU may be key to altering developmental trajectories of preterm infants.**	Brunelli SA Ludwig RJ, Myers MM Journal of Child Psychology and Psychiatry **2015** Mar 11. doi: 10.1111/ jcpp.12405
abstract **OBJECTIVE:** To determine whether a single-family room (SFR) NICU, including factors associated with the change to a SFR NICU, is associated with improved medical and neurobehavioral outcomes. **METHODS:** Longitudinal, prospective, quasi-experimental cohort study conducted between 2008 and 2012 comparing medical and neurobehavioral outcomes at discharge in infants born ,1500 g. Participants included 151 infants in an open-bay NICU and 252 infants after transition to a SFR NICU. Structural equation modeling was used to determine the role of mediators of relations between type of NICU and medical and neurobehavioral outcomes. **RESULTS:** Statistically significant results (all Ps #.05) showed that infants in the SFR NICU weighed more at discharge, had a greater rate of weight gain, required fewer medical procedures, had a lower gestational age at full enteral feed and less sepsis, showed better attention, less physiologic stress, less hypertonicity, less lethargy, and less pain. NICU differences in weight at discharge, and rate of weight gain were mediated by increased developmental support; differences in number of medical procedures were mediated by increased maternal involvement. NICU differences in attention were mediated by increased developmental support. Differences in stress and pain were mediated by maternal involvement. Nurses reported a more positive work environment and attitudes in the SFR NICU. **CONCLUSIONS: The Single-Family Room is associated with improved neurobehavioral and medical outcomes. These improvements are related to increased developmental support and maternal involvement.**	**17. Single-Family Room Care and Neurobehavioral and Medical Outcomes in Preterm Infants** Lester MB, Hawes K, Abar B, Sullivan M, Miller R, Bigsby R, Laptook A, Salisbury A, Taub M, Lagasse LL, F. Padbury JF. Pediatrics **2014;**134:754–760
A B S T R A C T **Background** Skin-to-skin care (SSC), otherwise known as Kangaroo Care (KC) due to its similarity with marsupial behaviour of ventral maternal-infant contact, is one non-pharmacological intervention for pain control in infants. **Objectives** **The primary objectives** were to determine the effect of SSC alone on pain from medical or nursing procedures in neonates undergoing painful procedures compared to no intervention, sucrose or other analgesics, or additions to simple SSC such as rocking; and the effects	**18. Skin-to-skin care for procedural pain in neonates (Review)** Johnston C, Campbell-Yeo M, Fernandes A, Inglis D, Streiner D, Zee R

of the amount of SSC (duration in minutes) and the method of administration (who provided the SSC, positioning of caregiver and neonate pair). **The secondary objectives** were to determine the incidence of untoward effects of SSC and to compare the SSC effect in different postmenstrual age subgroups of infants**.** **Search methods** The standard methods of the CochraneNeonatal Collaborative Review Group were used. Databases searched in August 2011: Cochrane Central Register of Controlled Trials (CENTRAL) in *The Cochrane Library*); Evidence-Based Medicine Reviews; MEDLINE (1950 onwards); PubMed (1975 onwards); EMBASE (1974 onwards); CINAHL (1982 onwards); Web of Science (1980 onwards); LILACS database (1982 onwards); SCIELOdatabase (1982 onwards); PsycInfo (1980 onwards); AMED(1985 onwards); Dissertation-Abstracts International (1980 onwards). Searches were conducted throughout September 2012. **Selection criteria** Studies with randomisation or quasi-randomisation, double or single-blinded, involving term infants (> 37 completed weeks postmenstrual age (PMA)) to a maximum of 44 weeks PMA and preterm infants (< 37 completed weeks PMA) receiving SSC for painful procedures conducted by doctors, nurses, or other healthcare professionals. **Data collection and analysis** The main outcome measures were physiological or behavioural pain indicators and composite pain scores. A weighted mean difference (WMD) with 95% confidence interval (CI) using a fixed-effect model was reported for continuous outcome measures. We included variations on type of tissue-damaging procedure, provider of care, and duration of SSC. **Main results** Nineteen studies (n = 1594 infants) were included. Fifteen studies (n = 744) used heel lance as the painful procedure, one study combined venepuncture and heel stick (n = 50), two used intramuscular injection, and one used 'vaccination' (n = 80). The studies that were included were generally strong and free from bias. Eleven studies (n = 1363) compared SSC alone to a no-treatment control. Although 11 studies measured heart rate during painful procedures, data from only four studies (n = 121) could be combined to give a mean difference (MD) of 0.35 beats per minute (95% CI -6.01 to 6.71). Three other studies that were not included in meta-analyses also reported no difference in heart rate after the painful procedure. Two studies reported heart rate variability outcomes and found no significant differences. Five studies used the Premature Infant Pain Profile (PIPP) as a primary outcome, which favoured SCC at 30 seconds (n = 268) (MD -3.21, 95% CI -3.94 to -2.48), 60 seconds (n = 164) (MD -1.85, 95% CI -3.03 to -0.68), and 90 seconds (n = 163) (MD -1.34, 95% CI -2.56 to -0.13), but at 120 seconds (n = 157) there was no difference. No studies provided findings on return of heart rate to baseline level, oxygen saturation, cortisol levels, duration of crying, and facial actions that could be combined for analysis. Eight studies compared SSC to another intervention with or without a no-treatment control. Two cross-over studies (n = 80) compared mother versus other	**The Cochrane Database Syst Review, 2014**

provider on PIPP scores at 30, 60, 90, and 120 seconds with no significant difference. When SSC was compared to other interventions, there were not enough similar studies to pool results in an analysis. One study compared SSC with and without dextrose and found that the combination was most effective and that SSC alone was more effective than dextrose alone. Similarly, in another study SSC was more effective than oral glucose for heart rate but not oxygen saturation. SSC either in combination with breastfeeding or alone was favoured over a no-treatment control, but was not different to breastfeeding. There were not enough participants with similar outcomes and painful procedures to compare age groups or duration of SSC. No adverse events were reported in any of the studies. **Authors' conclusions** SSC appears to be effective, as measured by composite pain indicators and including both physiological and behavioural indicators, and safe for a single painful procedure such as a heel lance. Purely behavioural indicators tended to favour SSC but there remains questionable bias regarding behavioural indicators. Physiological indicators were typically not different between conditions. Only two studies compared mother providers to others, with non-significant results. There was more heterogeneity in the studies with behavioural or composite outcomes. There is a need for replication studies that use similar, clearly defined outcomes. New studies examining optimal duration of SSC, gestational age groups, repeated use, and long-term effects of SSC are needed.	
A B S T R A C T **Background** Administration of oral sucrose with and without non-nutritive sucking is themost frequently studied non-pharmacological intervention for procedural pain relief in neonates. **Objectives** To determine the efficacy, effect of dose and safety of oral sucrose for relieving procedural pain in neonates. **Search methods** We used the standard methods of the Cochrane Neonatal Review Group. Electronic and manual searches were performed in November 2011 for published randomised controlled trials (RCTs) inMEDLINE (1950 to November 2011), EMBASE (1980 to 2011), CINAHL (1982 toNovember 2011) and the Cochrane Central Register of Controlled Trials (*The Cochrane Library*). We did not impose language restrictions. **Selection criteria** RCTs in which term, preterm, or both term and preterm neonates (postnatal age maximum of 28 days after reaching 40 weeks' postmenstrual age) received sucrose for procedural pain. Control conditions included no treatment, water, pacifier, positioning/containing or breastfeeding. **Data collection and analysis** Main outcome measures were physiological, behavioural, or both pain indicators with or without composite pain scores. A mean difference (MD) with 95% confidence intervals (CI) using the fixed-effect model was reported for continuous outcome measures. Trial quality was assessed as per The Cochrane Collaboration Sucrose for analgesia in newborn infants undergoing painful procedures (Review) 1 Copyright © 2013 The Cochrane	**19. Sucrose for analgesia in newborn infants undergoing painful procedures** Stevens B, Yamada J, Lee GY, Ohlsson A **The Cochrane Database Syst Review, 2013**

Collaboration. Published by JohnWiley & Sons, Ltd. **Main results** Fifty-seven studies enrolling 4730 infants were included. Results from only a few studies could be combined in meta-analyses. When Premature Infant Pain Profile (PIPP) scores were pooled, sucrose groups had significantly lower scores at 30 seconds (weighted mean difference (WMD) -1.76; 95%CI -2.54 to - 0.97; 4 trials; 264 neonates] and 60 seconds (WMD-2.05; 95%CI -3.08 to -1.02; 3 trials' 195 neonates) post-heel lance. For retinopathy of prematurity (ROP) examinations, sucrose did not significantly reduce PIPP scores (WMD -0.65; 95% CI -1.88 to 0.59; 3 trials; 82 neonates). There were no differences in adverse effects between sucrose and control groups. Sucrose significantly reduced duration of total crying time (WMD -39 seconds; 95% CI -44 to -34; 2 trials; 88 neonates), but did not reduce duration of first cry during heel lance (WMD -9 seconds; 95% CI -20 to 2; 3 trials; 192 neonates). Oxygen saturation (%) was significantly lower in infants given sucrose during ROP examination compared to controls (WMD -2.6; 95% CI -4.9 to - 0.2; 2 trials; 62 neonates). Results of individual trials that could not be incorporated in meta-analyses supported these findings. The effects of sucrose on long-term neurodevelopmental outcomes are unknown. **Authors' conclusions** Sucrose is safe and effective for reducing procedural pain fromsingle events. An optimal dose could not be identified due to inconsistency in effective sucrose dosage among studies. Further investigation on repeated administration of sucrose in neonates and the use of sucrose in combination with other non-pharmacological and pharmacological interventions is needed. Sucrose use in extremely preterm, unstable, ventilated (or a combination of these) neonates needs to be addressed. Additional research is needed to determine the minimally effective dose of sucrose during a single painful procedure and the effect of repeated sucrose administration on immediate (pain intensity) and long-term (neurodevelopmental) outcomes.	
Sweet taste is believed to trigger the release of endogenous opioids. The analgesic efficacy of a solution may be dependent on its degree of sweetness, with the order from highest to lowest degree of sweetness being sucrose, fructose, glucose and lactose. Manufactured sucrose may not always be readily available or institutions may not be equipped with pharmacies to prepare sucrose solutions; therefore, the efficacy of alternative sweet solutions, such as glucose, as analgesic strategies for painful procedures in neonates needs to be determined. **Abstract** **Background:** Sucrose has been demonstrated to provide analgesia for minor painful procedures in infants. However, results of trials investigating other sweet solutions for neonatal pain relief have not yet been synthesized. **Objective:** To establish the efficacy of nonsucrose sweet-tasting solutions for pain relief during painful procedures in term and preterm neonates (from birth to one month of age).	**20. A systematic review and meta-analyses of nonsucrose sweet solutions for pain relief in neonates.** M Bueno, J Yamada, D Harrison, S Khan, A Ohlsson, T Adams-Webber, J Beyene, B Stevens Pain Res Manag **2013;**18(3):153-

Method: The present article is a systematic review and meta-analyses of the literature. Standard methods of the Cochrane Neonatal Collaborative Review Group were used. Literature searches were reviewed for randomized controlled trials investigating the use of sweet solutions, except sucrose, for procedural pain management in neonates. Outcomes assessed included validated pain measures and behavioural and physiological indicators. **Results:** Thirty-eight studies (3785 neonates) were included. Glucose was investigated in 35 trials, with doses ranging from 0.2 mL to 2 mL of 5% to 50% solutions. Other solutions studied were artificial sweeteners, fructose, glycine, honey and maltitol. Solutions were administered to the anterior portion of the tongue using a syringe in the majority of the trials. Akcam and Ormeci compared the use of spray and syringe to administer 30% glucose to infants. Non-nutritive sucking was offered in combination with the sweet solution in five trials (22-26). In four studies, neonates were stimulated to suck the syringe during the administration of the solutions (27-30). Gradin et al (31) described the use of a pacifier or a finger for providing sucking after offering the solution as optional. Finally, Kass and Holman (32), Sajedi et al (33) and Gharehbaghi and Ali (34) did not provide sufficient information regarding the methods used to administer sweet solutions before the procedure. Control and/or comparison groups received water (with or without sucking), pacifier, swaddling, skin to skin contact, sensorial saturation, facilitated tucking, sucrose solution (with or without sucking), breastfeeding, expressed breast milk, 2.5% lidocaine/2.5% prilocaine cream (EMLA; AstraZeneca, United Kingdom), dorsal penile nerve block, acetaminophen, oxycodone or inhaled sevoflurane. No intervention groups were included in eight trials and water groups were included in 19 trials. In six trials, both no intervention and water groups were evaluated (Table 1). Painful procedures investigated were heel lance (19 studies), venipuncture (10 studies), intramuscular injection (three studies), subcutaneous injection (one study), peripherally inserted central catheter (PICC) placement (one study), eye examination for retinopathy of prematurity (one study) and circumcision (one study). Two studies analyzed pain during different procedures: heel lance and venipuncture (one study), and heel lance and pharyngeal suctioning (one study). Heel lancing was performed in 21/38 studies and venipuncture in 11/38 studies. A 3.6-point reduction in Premature Infant Pain Profile scores during heel lances was observed in studies comparing 20% to 30% (1ml to 2ml) glucose with no intervention (two studies, 124 neonates, Eriksson term infants, Freire preterm infants; mean difference −3.6 [95% CI −4.6 to −2.6]; P<0.001; I2=54%).	161.

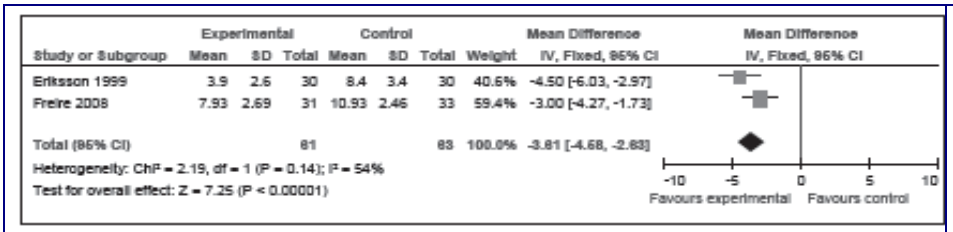

Figure 2) *Mean Premature Infant Pain Profile scores after heel lancing for infants receiving 20% to 30% glucose (1 mL to 2 mL) compared with no intervention*

Two trials used the NIPS and the PIPP to assess the same heel lance (47,51). Bonetto et al (47) reported no differences in PIPP scores, while NIPS scores significantly favoured 25% glucose (1 mL) versus 2.5% lidocaine/2.5% prilocaine cream, acetaminophen or water. Axelin et al (51) reported significantly lower PIPP scores for neonates receiving 24% glucose (0.2 mL) versus water (0.2 mL) but reported no differences in NIPS scores.

In the one trial that compared 20% glucose and sucrose (2 mL) solutions (36), differences in NFCS scores were not significant. **These results suggest similar effectiveness of both glucose and sucrose.**

A significant reduction in the incidence of cry after venipuncture for infants receiving 25% to 30% glucose versus water or no intervention was observed (three studies, 130 infants; risk difference −0.18 [95% CI −0.31 to −0.05]; P=0.008, number needed to treat = 6 [95% CI 3 to 20]; I2=63%).

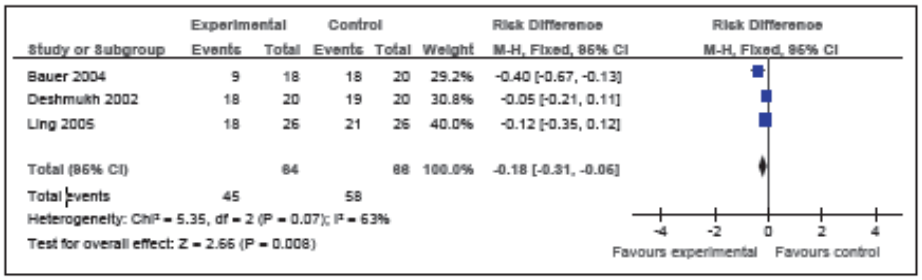

Figure 3) *Incidence of crying after venipuncture for infants receiving 25% to 30% glucose (1 mL to 2 mL) compared with water*

Conclusions: The present systematic review and meta-analyses demonstrate that glucose reduces pain scores and crying during single heel lances and venipunctures. Results indicate that 20% to 30% glucose solutions have analgesic effects and can be recommended as an alternative to sucrose for procedural pain reduction in healthy term and preterm neonates.

Abstract

BACKGROUND: Physiological changes brought about by pain may contribute to the development of morbidity in neonates. Clinical studies have shown reduction in changes in physiological parameters and pain score measurements following pre-emptive analgesic administration in situations where the neonate is experiencing pain or stress. Non-pharmacological measures (such as holding, swaddling and breastfeeding) and pharmacological measures (such as acetaminophen, sucrose and opioids) have been used for this purpose.

OBJECTIVES: The primary objective was to evaluate the

21. Breastfeeding or breast milk for procedural pain in neonates.

Shah PS, Herbozo C, Aliwalas LL, Shah VS. Cochrane Database Syst Rev. **2012** Dec

effectiveness of breastfeeding or supplemental breast milk in reducing procedural pain in neonates. The secondary objective was to conduct subgroup analyses based on the type of control intervention, gestational age and the amount of supplemental breast milk given. **SEARCH METHODS:** We performed a literature search using the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2011, Issue 10), MEDLINE (1966 to February 2011), EMBASE (1980 to February 2011), CINAHL (1982 to February 2011), abstracts from the annual meetings of the Society for Pediatric Research (1994 to 2011), and major paediatric pain conference proceedings. We did not apply any language restrictions. **SELECTION CRITERIA:** Randomised controlled trials (RCTs) or quasi-RCTs of breastfeeding or supplemental breast milk versus no treatment/other measures in neonates were eligible for inclusion in this review. The study must have reported on either physiologic markers of pain or validated pain scores. **DATA COLLECTION AND ANALYSIS:** We assessed the methodological quality of the trials using the information provided in the studies and by personal communication with the authors. We extracted data on relevant outcomes, estimated the effect size and reported this as a risk ratio (RR), risk difference (RD) and weighted mean difference (MD) as appropriate. **MAIN RESULTS:** Of twenty eligible studies, ten evaluated breastfeeding and ten evaluated supplemental breast milk. Sixteen studies analysed used heel lance and four used venepuncture as procedure. We noted marked heterogeneity in control intervention and pain assessment measures among the studies. **Neonates in the breastfeeding group had statistically a significantly lower increase in heart rate, reduced proportion of crying time and reduced duration of first cry and total crying time compared to positioning (swaddled and placed in a crib), holding by mother, placebo, pacifier use, no intervention or oral sucrose group, or both.** Premature Infant Pain Profile (PIPP) scores were significantly lower in the breastfeeding group compared to positioning, placebo or oral sucrose group, or both. However, there was no statistically significant difference in PIPP scores when compared to no intervention. Douleur Aigue Nouveau-ne scores (DAN) were significantly lower in the breastfeeding group compared to the placebo group and the group held in mother's arms, but not when compared to the glucose group. Neonatal Infant Pain Scale (NIPS) was significantly lower in the breastfeeding group compared to the no intervention group, but there was no difference when compared to the oral sucrose group. The Neonatal Facial Coding System (NFCS) was significantly lower in the breastfeeding group when compared to oral glucose, pacifier use, holding by mother and no intervention, but no difference was found when compared to formula feeding. Supplemental breast milk yielded variable results. Neonates in the supplemental breast milk group had a significantly lower increase in heart rate, a reduction in duration of crying and a lower NFCS compared to the placebo group. Neonates in the supplemental breast milk group had a significantly higher increase	12;12:CD004950. doi: 10.1002/14651858. CD004950.pub3.

in heart rate changes when compared to the sucrose group. Sucrose (in any concentration, i.e. 12.5%, 20%, 25%) was found to reduce the duration of cry when compared to breast milk, as did glycine, pacifier use, rocking, or no intervention. Breast milk was found not to be effective in reducing validated and non-validated pain scores such as NIPS, NFCS, and DAN; only being significantly better when compared to placebo (water) or massage. We did not identify any study that has evaluated safety/effectiveness of repeated administration of breastfeeding or supplemental breast milk for pain relief. **AUTHORS' CONCLUSIONS: If available, breastfeeding or breast milk should be used to alleviate procedural pain in neonates undergoing a single painful procedure rather than placebo, positioning or no intervention. Administration of glucose/sucrose had similar effectiveness as breastfeeding for reducing pain. The effectiveness of breast milk for painful procedure should be studied in the preterm population, as there are currently a limited number of studies in the literature that have assessed it's effectiveness in this population.**	
Background: Acute pain and distress during medical procedures are commonplace for young children. **Objective:** To assess the efficacy of nonpharmacological interventions for acute procedural pain in children up to three years of age, excluding breastmilk, sucrose, and music. **Methods:** Study inclusion criteria were: participants <3 years of age, involved in a randomized controlled or crossover trial, and use of a 'notreatment' control group (51 studies; n=3396). Additional studies meeting all criteria except for study design (eg, use of active control group) were qualitatively described (n=20). **Preterm born:** infants born at 36 weeks gestation or less. **Neonate full-term:** infants born at 37 weeks until one month of age. **Older infant/young child:** infants older than one month to 36 months of age. **Pain reactivity:** measured within the first 30 s after the painful stimulus was discontinued. **Immediate pain-related regulation:** measured after the first 30 s post acutely painful stimulus. If multiple measurements were taken after the first 30 s elapsed, the measurement closest to the 30s-time point was used. **Results:** Fifty-one studies, with 3396 participants, were analyzed. The following painful procedures (determined by respective study authors rather than review authors) were included in this review: 29 studies examined treatments for heelstick, 10 studies examined needle-injection procedures, six studies assessed venipuncture, two examined NICU diaper changes, two studies investigated endotracheal suctioning and two studied a neonatal intensive care unit (NICU) weighing procedure. For every intervention, data were analyzed separately according to age group (preterm-born, term-born neonate and older infant/young child) and type of pain response (pain reactivity, immediate pain-related regulation). The largest SMD for treatment improvement over control conditions on pain reactivity were:: sucking-related interventions (preterm: −0.42 [95% CI −0.68 to −0.15]; neonate −1.45 [CI −2.34 to	**22. Nonpharmacological management of procedural pain in infants and young children: An abridged Cochrane review** Riddell RP, Racine N, Turcotte K, Uman LS, Horton R, Osmun LD, Kohut SA, Stuart JH, Stevens B, Lisi D. **Pain Res Manage 2011;16(5):321-330**

−0.57]), kangaroo care (preterm −1.12 [95% CI −2.04 to −0.21]), and swaddling/facilitated tucking (preterm −0.97 [95% CI −1.63 to −0.31]). For immediate painrelated regulation, the largest SMDs were: sucking-related interventions (preterm −0.38 [95% CI −0.59 to −0.17]; neonate −0.90 [CI −1.54 to −0.25]), kangaroo care 0.77 (95% CI −1.50 to −0.03]), swaddling/facilitated tucking (preterm −0.75 [95% CI −1.14 to −0.36]), and rocking/holding (neonate −0.75 [95% CI −1.20 to −0.30]). The presence of significant heterogeneity limited confidence in nonsignificant findings for certain other analyses.

Table 3 presents the primary meta-analytic results from this review (SMD, 95% CI and I2) and, when applicable, the secondary statistics re-run with studies removed due to heterogeneity and/or study quality.

Table 3:

Summary of meta-analyses

Treatment	Age group	Pain type	Total, n	Effect size (95% CI)	Heterogeneity analysis (95% CI)	Risk of bias analysis (95% CI)
Kangaroo care	Preterm	Reactivity	177	−1.12 (−2.04 to −0.21) I^2 = 89%	−0.38 (−0.65 to −0.12) I^2 = 0%	–
Kangaroo care	Preterm	Immediate regulation	163	−0.77 (−1.50 to −0.03) I^2 = 82%	−0.45 (−0.69 to −0.20) I^2 = 0%	–
Kangaroo care	Neonate	Reactivity	420	−0.89 (−2.89 to 1.10) I^2 = 98%	–	–
Kangaroo care	Neonate	Immediate regulation	343	−0.66 (−1.73 to 0.42) I^2 = 82%	–	–
Swaddling/tucking	Preterm	Reactivity	261	−0.97 (−1.63 to −0.31) I^2 = 88%	−0.90 (−1.22 to −0.59) I^2 = 0%	–
Swaddling/tucking	Preterm	Immediate regulation	65	−0.75 (−1.14 to −0.36) I^2 = 0%	–	−0.61 (−1.12 to −0.11) I^2 = 0%
Swaddling/tucking	Neonate	Reactivity	42	−1.26 (−1.92 to −0.60)	–	–
Non−nutritive sucking	Preterm	Reactivity	305	−0.42 (−0.68 to −0.15) I^2 = 48%	−0.32 (−0.05 to −0.15) I^2 = 0%	–
Non−nutritive sucking	Preterm	Immediate regulation	226	−0.38 (−0.59 to −0.17) I^2 = 0%	–	−0.36 (−0.59 to −0.13) I^2 = 0%
Non−nutritive sucking	Neonate	Reactivity	220	−1.45 (−2.34 to −0.57) I^2 = 88%	−1.88 (−2.25 to −1.50) I^2 = 0%	–
Non−nutritive sucking	Neonate	Immediate regulation	325	−0.90 (−1.54 to −0.25) I^2 = 84%	–	−0.51 (−0.91 to −0.29) I^2 = 11%
Non−nutritive sucking	Older infants	Immediate regulation	41	−0.89 (−1.53 to −0.25)	–	–
Swallowing water	Preterm	Reactivity	36	−0.24 (−0.71 to 0.23)	–	–
Swallowing water	Preterm	Immediate regulation	36	−0.23 (−0.70 to 0.24)	–	–
Swallowing water	Neonate	Reactivity	50	0.10 (−0.45 to 0.66)	–	–
Swallowing water	Neonate	Immediate regulation	34	−0.53 (−1.21 to 0.16)	–	–
Swallowing water	Older infants	Immediate regulation	30	0.00 (−0.72 to 0.72)	–	–
Rocking/holding	Neonate	Reactivity	131	−0.33 (−1.05 to 0.39) I^2 = 73%	–	–
Rocking/holding	Neonate	Immediate regulation	81	−0.75 (−1.20 to −0.30) I^2 = 0%	–	–
Rocking/holding	Older infants	Reactivity	106	0.23 (−0.15 to 0.62)	–	–
Simulated rocking + water	Preterm	Reactivity	44	0.00 (−0.59 to 0.59)	–	–
Touch or massage	Preterm	Immediate regulation	34	−0.71 (−2.33 to 0.90) I^2 = 86%	–	–
Touch or massage	Neonate	Reactivity	40	−0.30 (−0.92 to 0.32)	–	–
Touch or massage	Neonate	Immediate regulation	66	−0.24 (−0.73 to 0.24)	–	–
Touch or massage	Older infants	Reactivity	20	−0.21 (−0.84 to 0.41)	–	–
Environment modification	Preterm	Reactivity	64	−6.44 (−17.13 to 4.26) I^2 = 97%	–	–
Environment modification	Preterm	Immediate regulation	45	−4.01 (−5.26 to −2.77)	–	–
Toy distraction	Older infants	Reactivity	259	−0.10 (−0.35 to 0.14) I^2 = 0%	–	–
Toy distraction	Older infants	Immediate regulation	133	−0.08 (−0.50 to 0.33) I^2 = 0%	–	–
Video distraction	Older infants	Reactivity	90	−0.70 (−1.13 to −0.27)	–	–
Video distraction	Older infants	Immediate regulation	126	−0.84 (−1.20 to −0.47)	–	–
Structured parent involvement	Older infants	Reactivity	209	−0.26 (−0.70 to 0.17) I^2 = 60%	−0.49 (−0.83 to −0.14) I^2 = 0%	–
Structured parent involvement	Older infants	Immediate regulation	288	0.02 (−0.21 to 0.25)	–	–
Mother's voice	Preterm	Reactivity	19	−0.29 (−0.94 to 0.35)	–	–
Parent present	Older infants	Immediate regulation	278	0.00 (−0.24 to 0.23)	–	–

**Dash indicates no research performed for that treatment, age and pain response combination*

The summary interpretation of the primary meta-analytic findings, contextualized by secondary heterogeneity and quality/treatment integrity analyses, are presented in Table 4. Based on these results, treatments were assigned a number from 1 to 4, for each age and pain response type. As will be discussed below, the ratings reflect whether, as the literature currently stands, evidence supported the specific treatment for pain management (efficacy) or did not support the specific
treatment for pain management (inefficacy). Each treatment's efficacy or inefficacy was further qualified by the level of support (sufficient versus limited). Treatment efficacy was denoted by either a 1 (sufficient evidence, ie, two or more quality trials supporting efficacy) or 2 (limited evidence, ie, either due to quality, quantity or heterogeneity of trials,
supporting efficacy). Treatment inefficacy was denoted by either a 3 (limited evidence [ie, either due to quality, quantity or trial heterogeneity]) or a 4 (sufficient evidence [ie, two or more quality trials supporting inefficacy]). Blank cells indicate no applicable research for
that combination of treatment, age and pain response.

TABLE 4
Summary conclusions

	Preterm infants		Neonates		Older infants	
Treatment arm	Reactivity	Immediate regulation	Reactivity	Immediate regulation	Reactivity	Immediate regulation
Kangaroo care	1	1	3	3	–	–
Non-nutritive sucking-related	1	1	1	1	–	2
Swaddling/tucking-related	1	1	2	–	–	–
Touch or massage-related	–	3	3	3	3	–
Environment modification	3	2	–	–	–	–
Simulated rocking and water	3	–	–	–	–	–
Simulated mother's voice	3	–	–	–	–	–
Swallowing water	3	3	3	3	–	3
Rocking or holding	–	–	3	1	3	–
Toy distraction	–	–	–	–	4	3
Video distraction	–	–	–	–	2	2
Parent present	–	–	–	–	–	3
Structured parent involvement	–	–	–	–	3	3

1 Sufficient evidence supports efficacy for reducing pain-related behaviours (support of two or more trials); 2 Limited evidence suggests efficacy for reducing pain-related behaviours (eg, support of one trial or heterogeneity among trials); 3 Limited evidence suggests inefficacy for reducing pain-related behaviours (eg, support of one trial or heterogeneity among trials); 4 Sufficient evidence supports inefficacy for reducing pain-related behaviours (support of one or more trials). Dash indicates no research performed for that treatment, age and pain response combination

Kangaroo care (also known as skin-to-skin contact) An infant is placed on their caregiver's bare chest before, during and after a painful procedure. **Preterm infants: Sufficient evidence suggests kangaroo care is efficacious in reducing pain reactivity and improving immediate painrelated regulation.** While there was substantial heterogeneity, secondary analyses confirmed this finding. Four studies that were excluded from the statistical analyses (73-76) also indirectly support kangaroo care as efficacious in improving pain reactivity and immediate pain-related regulation in preterm infants.

Swaddling/facilitated tucking A swaddled infant is securely wrapped in a blanket to prevent excessive movement. Facilitated tucking is a hand-swaddling technique that holds the infant's extremities flexed and contained. **Preterm infants: There was sufficient evidence to support the use of swaddling/tucking as an efficacious intervention for reducing painrelated distress reactivity and immediate pain-related regulation in preterm infants.** Two studies (74,77), that were not included in the analysis due to use of an active control group,

suggested that swaddling was as efficacious as containment but not as efficacious as kangaroo care. **Non-nutritive sucking-related strategies** An object (eg, pacifier, nonlactating nipple) is placed into an infant's mouth to stimulate orotactile or sucking behaviours during a painful event. **Preterm infants: There is sufficient evidence that sucking is efficacious in reducing pain-related distress reactivity and improving immediate pain-related regulation. Pain relief may be maximized if sucking begins at least 3 min before the painful stimuli. Two studies that were not included in the analyses due to the use of an active control group (85,89) also suggest that sucking helps diminish pain reactivity.** **Swallowing water** Water is administered for ingestion without inciting extensive sucking (eg, water administered by a dropper). **Preterm infants: There was limited evidence that water is an inefficacious** **intervention for pain reactivity or immediate pain-related regulation for preterm infants.** **Rocking and/or holding** An infant is held and/or gently moved up and down or side-to-side by a caregiver**. – no preterm** **Artificial rocking and water** An infant is placed in a bassinet-type machine that provides a swaying motion. Water is administered via a dropper. **Preterm infants: Limited evidence indicates that simulated rocking and water is not an efficacious intervention for reducing pain-related distress pain reactivity for preterm infants.** **Touch/massage/therapeutic touch** An infant's body (i.e. touch, massage) or energy field (therapeutic touch) is 'stroked' or rubbed to provide some type of counter-stimulation to the nociceptive input. **Preterm infants: Current evidence does not support touch/massagerelated interventions as efficacious in improving the immediate painrelated regulation but caution is warranted given the presence of substantial heterogeneity.** One study not included in the analysis due to exclusion criteria (79) demonstrated that massage was more efficacious at reducing preterm infant's heart rate than light pressure or no massage therapy. **Environmental modification** Interventions involved modifying the environment in which an infant experiences painful procedures (ie, low noise and lighting, clustering procedures to avoid over handling, soothing smells). **Preterm infants: While the pooled result from two studies suggest that environmental modification was not efficacious for pain reactivity, this must be interpreted with caution due to substantial heterogeneity. However, there is limited evidence to suggest that environmental modification is efficacious for immediate pain-related regulation.** **Simulated maternal voice** An infant is exposed to a reproduction of the mother's voice to help simulate the fetal environment. **Preterm infants: Results from one study indicated that mother's voice was not more efficacious than a no-treatment control for reducing pain-related distress reactivity for preterm infants.** **Conclusions: Although a number of nonpharmacological**	

treatments have sufficient evidence supporting their efficacy with preterm infants and healthy neonates, no treatments had sufficient evidence to support efficacy with healthy older infants/young children. **-We examined 13 different types of commonly investigated nonpharmacological treatments (excluding breastmilk, sucrose, and music) to determine their efficacy for pain reactions after an acutely painful procedure (right after the needle ('pain reactivity') and less immediate pain reactions ('immediate pain-related regulation').** **-<u>For preterm infants, there was sufficient evidence to recommend kangaroo care, sucking-related interventions, and swaddling /facilitated tucking interventions for both pain reactivity and immediate pain-related regulation.</u>**	
Abstract **Background:** Pain and stress agitate preterm infants, interrupting their sleep. Frequent high arousal states may affect infants' brain development and illness recovery. Preserving infants' sleep and relieving their pain during painful procedures are both important for their health. **Objectives:** To compare the effectiveness of different combinations of non-nutritive sucking (sucking), oral sucrose, and facilitated tucking (tucking) with routine care on infants' sleep–wake states before, during, and after heel-stick procedures. **Design:** Prospective, randomised controlled trial. **Setting:** Level III Neonatal Intensive Care Unit in Taipei. **Method:** A convenience sample of 110 infants (gestational age 26.4–37 weeks) needing heel sticks were randomly assigned to five combinations of non-pharmacological treatments: sucking–oral sucrose–tucking; sucking–oral sucrose; oral sucrose–tucking; sucking–tucking; and routine care. Infant states, measured by a state-coding scheme, included quiet sleep, active sleep, transition, quiet awake, active awake, and fussing or crying. All states were recorded at 1-min intervals during four phases: baseline, intervention, heel-stick procedures, and recovery. **Results:** Infants receiving sucking–oral sucrose–tucking or sucking–oral sucrose experienced 52.8% ($p = 0.023$) and 42.6% ($p = 0.063$) more quiet-sleep occurrences than those receiving routine care after adjusting for phase, baseline states, non-treatment sucking during baseline and recovery, positioning, and infants' characteristics. Infants receiving oral sucrose–tucking, sucking–oral sucrose, sucking–oral sucrose–tucking, and sucking–tucking experienced 77.3% ($p < 0.001$), 72.1% ($p = 0.008$), 51.5% ($p = 0.017$), and 33.0% ($p = 0.105$) fewer occurrences of fussing or crying, respectively, than those receiving routine care after adjusting for related factors. **Conclusions: The four treatment combinations differentially reduced infants' high arousal across heel-stick procedures. The combined use of oral sucrose–tucking, sucking–oral sucrose, and sucking–oral sucrose–tucking more effectively reduced occurrences of infant fussing or crying than routine care.**	**23. Effects of combined use of non-nutritive sucking, oral sucrose, and facilitated tucking on infant behavioural states across heel-stick procedures: A prospective, randomised controlled trial** Liaw JJ, Yang L, Lee CM, Fan HC, Chang YC, Cheng LP International Journal of Nursing Studies 50 **(2013)** 883–894

Treatment combinations of sucking–oral sucrose–tucking and sucking–oral sucrose also better facilitated infants' sleep than routine care. To preserve infants' sleep, clinicians should use combinations of non-nutritive sucking, oral sucrose, and facilitated tucking to reduce agitation during painful procedures.	
Abstract **Background:** Preterm infants manifest pain and stress by behavioural agitation and state change. Few studies have explored the effects of combining nonpharmacological interventions, i.e. non-nutritive sucking, oral sucrose, and facilitated tucking, on infants' behaviours across painful procedures. **Objectives:** To explore the effects of combined use of three nonpharmacological interventions (non-nutritive sucking, oral sucrose, and facilitated tucking) on infants' pain- and stress-related behaviours during four assessment phases: baseline, intervention, heel stick, and recovery. **Design:** Prospective, randomised controlled trial. **Setting**: Level III neonatal intensive care unit in Taipei. **Method:** A convenience sample of 110 infants (gestational age 27–37 weeks) needing heel sticks was randomly assigned to five combinations of nonpharmacological treatments: (1) routine care, (2) non-nutritive sucking + facilitated tucking, (3) oral sucrose + facilitated tucking, (4) non-nutritive sucking + oral sucrose, and (5) non-nutritive sucking + oral sucrose + facilitated tucking. Outcomes were infants' withdrawal or stress (grimace, limb and trunk extension or squirming) and approach or self-soothing (sucking, sucking search, or mouthing; hand holding or grasping; and hand to mouth, face) behaviours. **Results:** The frequency of infants' withdrawal behaviours decreased significantly when they received combinations of nonpharmacological interventions before heel stick. Specifically, grimace frequency decreased by 32.2%, 30.6%, 19.7%, and 13.8% in infants receiving oral sucrose + non-nutritive sucking + facilitated tucking, non-nutritive suck-ing + oral sucrose, oral sucrose + facilitated tucking, and non-nutritive sucking + facilitated tucking, respectively, compared to those receiving routine care across assessment phases. Furthermore, infants' frequency of limb and trunk extension or squirming decreased by 24.0% when they received non-nutritive sucking + oral sucrose + facilitated tucking compared to those receiving routine care. Infants' frequency of approach behaviours did not change significantly across all phases when they received non-nutritive sucking + oral sucrose + facilitated tucking, non-nutritive sucking + oral sucrose, and oral sucrose + facilitated tucking compared to those receiving routine care. **Conclusions: The combined use of nonpharmacological interventions (non-nutritive sucking + oral sucrose + facilitated tucking) effectively reduced the frequencies of infants' withdrawal behaviours, i.e. grimace and limb and trunk extension or squirming. Our results provide evidence supporting clinicians' incorporation of the combined use of facilitated tucking, oral sucrose, and non-nutritive sucking into clinical practice during painful procedures. Heel-stick procedures can be atraumatic when**	**24. Development of atraumatic heel-stick procedures by combined treatment with non-nutritive sucking, oral sucrose, and facilitated tucking: A randomised, controlled trial** Yin T, Yang L, Lee TY, Li CC, Hua YM, Liaw JJ International Journal of Nursing Studies 52 **(2015)** 1288–1299

conducted while infants are stable and quiet, appropriately positioned, and stabilised and by offering facilitated tucking, oral sucrose, and non-nutritive sucking before gently sticking the heel and squeezing blood.	
Abstract **OBJECTIVES:** To test the comparative effectiveness of 2 nonpharmacologic pain-relieving interventions administered alone or in combination across time for repeated heel sticks in preterm infants. **METHODS:** A multicenter randomized controlled trial in 3 NICUs in Switzerland compared the effectiveness of oral sucrose, facilitated tucking (FT), and a combination of both interventions in preterm infants between 24 and 32 weeks of gestation. Data were collected during the first 14 days of their NICU stay. Three phases (baseline, heel stick, recovery) of 5 heel stick procedures were videotaped for each infant. Four independent experienced nurses blinded to the heel stick phase rated 1055 video sequences presented in random order by using the Bernese Pain Scale for Neonates, a validated pain tool. **RESULTS:** Seventy-one infants were included in the study. Interrater reliability was high for the total Bernese Pain Scale for Neonates score (Cronbach's a: 0.90–0.95). **FT alone was significantly less effective in** **relieving repeated procedural pain** (P , .002) than sucrose (0.2 mL/kg). **FT in combination with sucrose seemed to have added value in the recovery phase with lower pain scores** (P = .003) compared with both the single-treatment groups. **There were no significant differences in pain responses across gestational ages**. **CONCLUSIONS: Sucrose with and without FT had pain-relieving effects even in preterm infants of <32 weeks of gestation having repeated pain exposures. These interventions remained effective during repeated heel sticks across time. FT was not as effective and cannot be recommended as a nonpharmacologic pain relief intervention for repeated pain exposure.**	**25. Oral sucrose and "facilitated tucking" for repeated pain relief in preterms: a randomized controlled trial.** Cignacco EL, Sellam G, Stoffel L, Gerull R, Nelle M, Anand KJ, Engberg S Pediatrics **2012**;129:299-308.

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Search	Add to builder	Query	Items found	Time
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