

Choice of skin antisepsis in Neonates and Children

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Disclosure

I have the following financial relationships to disclose:

- Employee of BD
- Distinguished Fellow, Infection Prevention
- This presentation does not reflect the views or opinions of BD



Objectives

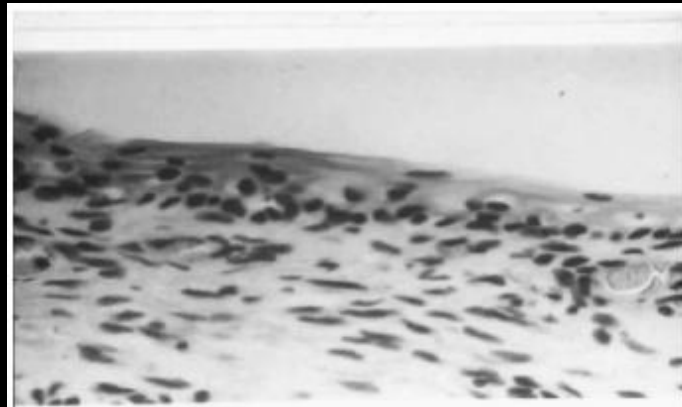
- In Choosing an Antiseptic for the Neonate/Pediatric patient
 - The skin barrier - AGE
 - Efficacy
 - Safety
 - Application methodology

No Antiseptic Product currently on the Market is approved for Neonate/Pediatric Patients!

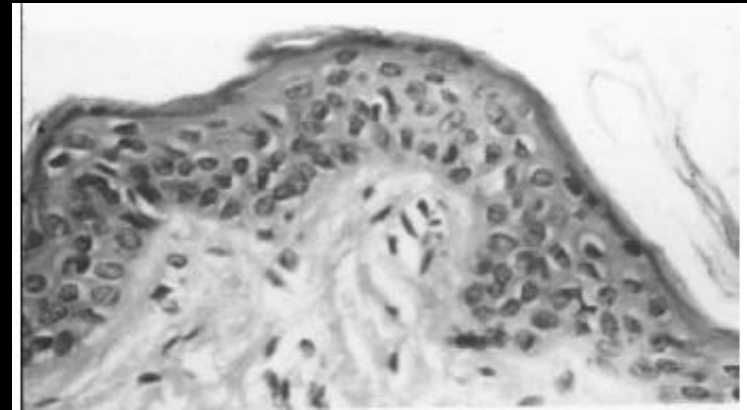


Neonate and skin development

The epidermis develops in the second trimester and is complete by 32-34 weeks gestation



26 week gestational neonate
Poorly developed epidermis, little to
no defined stratum corneum
NO PROTECTIVE SKIN BARRIER



Full term neonate
Mature epidermis with developed
stratum corneum
PROTECTIVE SKIN BARRIER

Structural & functional differences of Adult, Term, and Preterm Infant Skin

Skin characteristic	Adult	Term	Preterm	Importance
Epidermal thickness	50 μ m	50 μ m	27.4 μ m	Permeability to topical agents ↑ Transepidermal water loss
Cell attachments	Normal	Normal	Fewer	↑ Tendency to blister
Dermis	Normal	↓ Collagen and elastic fibers	↓↓ Collagen and elastic fibers	↓ Elasticity ↑ Blistering
Melanosomes	Normal	Fewer	One-third term infant	↑ Photosensitivity
Eccrine glands	Normal	↓ Activity for 7–10 d ↓ Neurologic control for 2–3 years	Total anhidrosis	↓ Response to thermal stress
Sebaceous glands	Normal	Normal	Normal	Possible barrier properties, lubricant, antibacterial
Hair	Normal	↓ Terminal hair	Persistent lanugo	Helps to assess gestational age

Characteristics of Common Antiseptics

Antiseptic agent	Mechanism of action	Advantages	Disadvantages	Preparations/ compounds
Chlorhexidine	Disruption of cytoplasmic membranes Denaturation of proteins	Broad spectrum antimicrobial activity Kills yeasts Intermediate onset of action Activity not affected by organic material Residual activity	Non-sporicidal Not effective against mycobacteria Local dermatitis Neurotoxicity	0.25%, 0.5%, 1%, 2%, 4% - aqueous and alcohol based
Alcohols	Damages cell membrane Denaturation of proteins	Broad spectrum antimicrobial activity Faster onset of action	Non-sporicidal Not active in presence of organic material No residual activity Skin reactions Systemic absorption	Ethanol, isopropyl alcohol, methanol
Iodine	Forms complexes with proteins and lipids Impaired protein synthesis and alteration of cell membranes	Broad spectrum antimicrobial activity Sporicidal	Skin irritation Systemic absorption with hypothyroidism	10% povidone-iodine

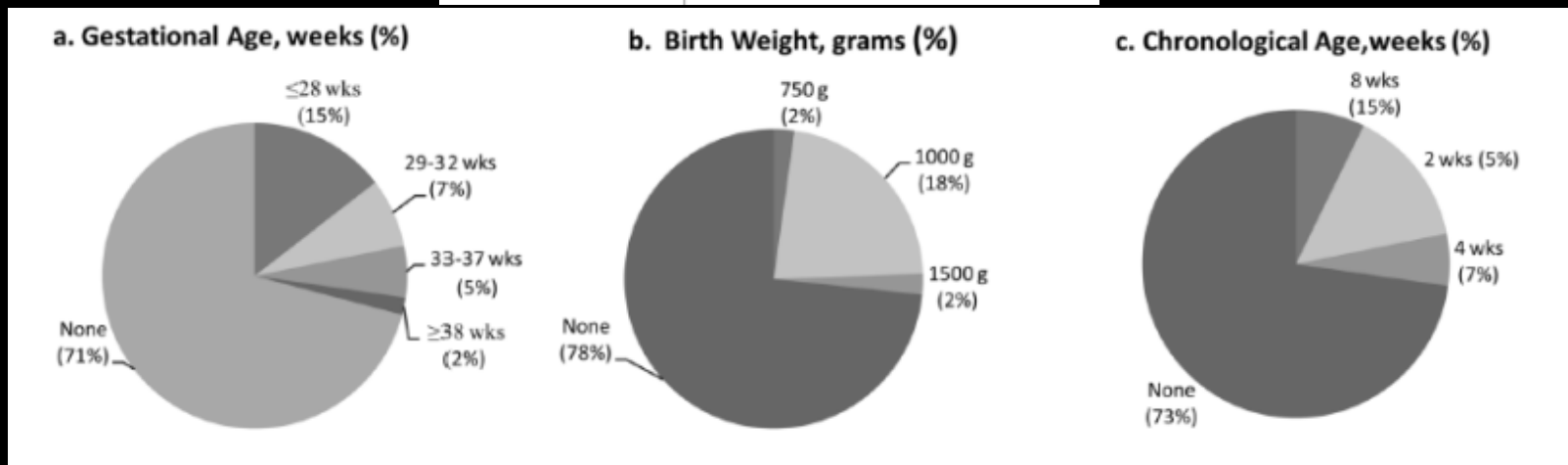
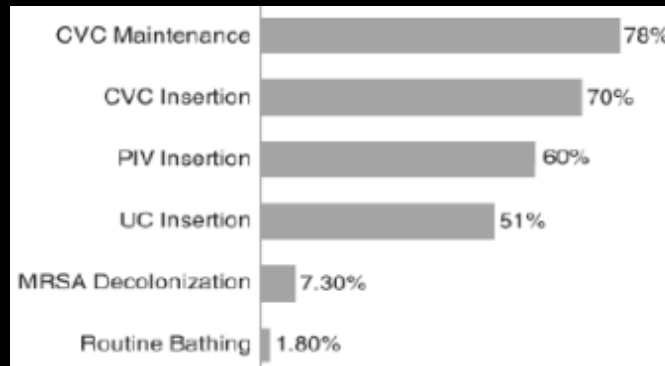
Multifactorial bundles in the NICU – Quality care initiatives

CLABSI Bundle:

Implemented maximum sterile barrier precautions
CVC team initiated
CHG for skin antisepsis/dressing changes (patients >2,000 g or >2 weeks)/Biopatch
CHG for skin antisepsis/dressing changes (patients >1,000 g or >2 weeks)
Began using masks for dressing changes
CHG for line maintenance
>100 days CABS free for Broviac patients
>100 days CABS free for PICC patients

Time Period	Total Patients with CVCs	Average Birth Weight Risk Stratification	Mean Duration of Catheter	Total Number of CABSIs	Rate of Infection
2007	n = 470 PICC = 414 Broviac = 56	PICC = 27% <1,000 g Broviac = 15% <1,000 g	PICC = 17 days Broviac = 56 days	PICC = 14 Broviac = 7	PICC = 1.7/1,000 catheter days Broviac = 3.3/1,000 catheter days
2008	n = 263 PICC = 240 Broviac = 23	PICC = 22% <1,000 g Broviac = 9% <1,000 g	PICC = 16 days Broviac = 34 days	PICC = 2 Broviac = 0	PICC = 0.5/1,000 catheter days Broviac = 0

Chlorhexidine use in USA –



Tamma PD, et al. CHG use in the NICU: Results from a National Survey. Infect Control Hosp Epidemiol. 2010; 31(8):846-849

Avoiding chemical burns



Antiseptic Application

Chemical Agent	Mechanism of Action	Method of Application	Drying Time	Comments
Chlorhexidine gluconate (CHG) with isopropyl alcohol (IPA)	Disrupts bacterial cell membranes Residual prevention of bacterial regrowth	Back-and-forth friction for 30 seconds	Less than 2 minutes	There are different concentrations of CHG available. Refer to each manufacturer's product-specific information
Chlorhexidine gluconate (CHG) in aqueous solution	Disrupts bacterial cell membranes Residual prevention of bacterial regrowth	Apply over 30 seconds with 2 × 2 sterile gauze	Does not dry, remains soapy	Must be removed to allow dressing adherence. AHFS 2006
Povidone–iodine	Destroys bacterial protein and DNA	Preparation in circular motion for 30 seconds, outward from the insertion site	At least 2 min	Presence of blood or organic materials neutralizes effects
Alcohol	Denatures cell proteins	Apply with some friction 3 times in circles progressing away from procedure site	Less than 1–2 min	MacDonald and Ramasethu ⁴²

FIGURE 4. (a and b).



(a)



(b)

The changer holds the already-prepped proximal portion of the extremity and prepares the distal portion of the extremity.

Guidelines

- AWHONN – Association of Women’s Health, Obstetric and Neonatal Nurses (2013)
 - Neonatal Skin Care

Cord Care

- Clean cord with neutral pH cleanser or sterile water.
- Wash hands before handling umbilical cord.
- Keep cord area clean and dry, cleanse with water if soiled with urine or stool.
- Keep diaper folded under the cord.
- Identify signs of abnormal healing, contact primary care provider.
- Educate staff and families about normal mechanism of cord healing.

Skin Assessment

- Assess skin condition daily.
- Identify risk factors for skin injury: gestational age <30 weeks, adhesive use, high frequency ventilation, hypotension requiring vasopressors, ECMO
- Use the Neonatal Skin Condition Score (NSCS) to measure skin condition objectively.

NSCS:

Dryness:

- 1= Normal, no signs of dry skin
- 2= Dry skin, visible scaling
- 3= Very dry skin, cracking/fissures

Erythema:

- 1= No evidence of erythema
- 2= Visible erythema, <50% body surface
- 3= Visible erythema, >50% body surface

Breakdowns:

- 1= None evident
- 2= Small, localized areas
- 3= Extensive

Disinfectants

There is no single product that is recommended for all neonates. All skin disinfectants have the potential for skin irritation, chemical burns, therefore, remove completely with water or saline.

- 2% aqueous CHG or 10% PI can be used for premature infants less than 34 weeks gestation
- 2% chlorhexidine in 70% isopropyl alcohol FDA approved as disinfectant device for infants >2 months; use in neonates is considered off label use.
- Povidone iodine has potential toxicity to thyroid function in premature infants.
- Avoid isopropyl alcohol for skin prep or removal of other disinfectants.

Labeling change in USA

- Pharmacovigilance and use of ChloroPrep (AND ALL CHG PRODUCTS) in the neonatal population led to a label change
- Do not use on infants < 2 months of age
- Use with caution on infants < 2 months of age

Thank you!

