SKIN ASSESSMENT -

IN THE NEWBORN INFANT

NIPIRA Study

August, D L
PhD Candidate
NNCA, October 2016
The Townsville Hospital and Health Service

JAMES COOK UNIVERSITY AUSTRALIA

Queensland Government

ACKNOWLEDGMENTS



Patients/Families, Neonatal Unit Staff, Health & Wellbeing Service Group

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- Mona Kendall Association
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- The Townsville Research Trust Fund
- Graduate Research School of James Cook University



Karen New, Robin Ray, Yoga Kandasamy & Liza Edmonds

AVATAR GROUP
Alliance for Vascular Access Teaching And Research

Peripheral intravenous catheter insertion & securement within Australian & New Zealand neonatal units: a cross-sectional survey.

NIPIRA Study

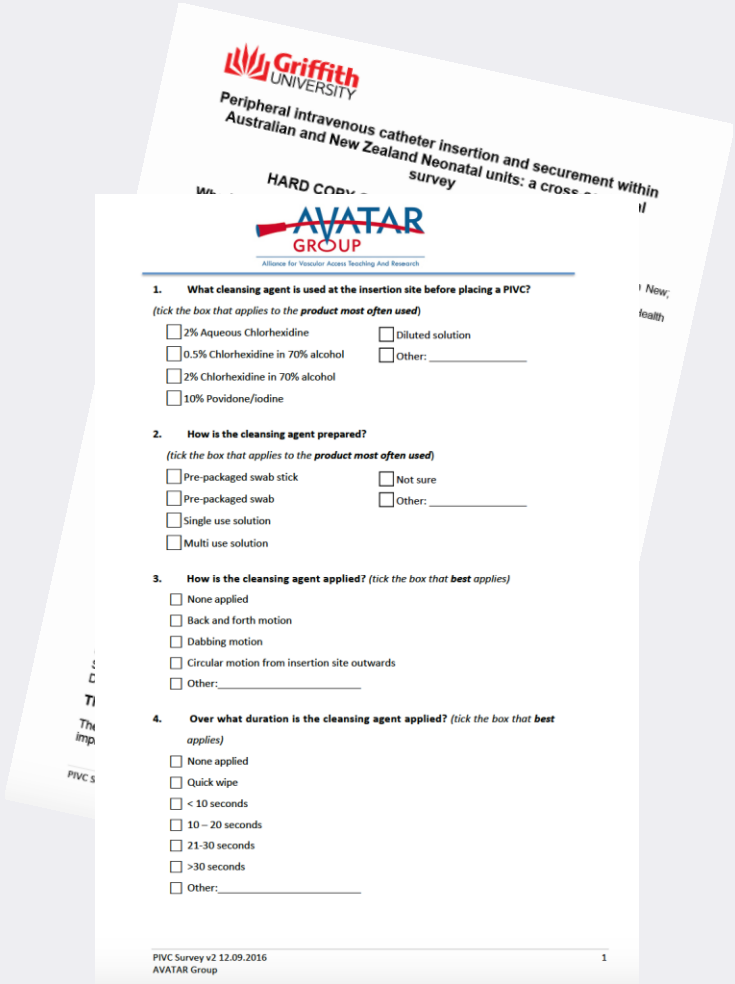
Red Envelope or Registration Desk :

Your name

& *Phone number*

Prize drawn

28th of October.


Griffith UNIVERSITY

Peripheral intravenous catheter insertion and securement within Australian and New Zealand Neonatal units: a cross-sectional survey

HARD COPY

AVATAR GROUP
Alliance for Vascular Access Teaching And Research

1. **What cleansing agent is used at the insertion site before placing a PIVC?**
*(tick the box that applies to the **product most often used**)*
- ☐ 2% Aqueous Chlorhexidine
- ☐ 0.5% Chlorhexidine in 70% alcohol
- ☐ 2% Chlorhexidine in 70% alcohol
- ☐ 10% Povidone/iodine
- ☐ Diluted solution
- ☐ Other: _____

2. **How is the cleansing agent prepared?**
*(tick the box that applies to the **product most often used**)*
- ☐ Pre-packaged swab stick
- ☐ Pre-packaged swab
- ☐ Single use solution
- ☐ Multi use solution
- ☐ Not sure
- ☐ Other: _____

3. **How is the cleansing agent applied?** *(tick the box that **best** applies)*
- ☐ None applied
- ☐ Back and forth motion
- ☐ Dabbing motion
- ☐ Circular motion from insertion site outwards
- ☐ Other:_____

4. **Over what duration is the cleansing agent applied?** *(tick the box that **best** applies)*
- ☐ None applied
- ☐ Quick wipe
- ☐ < 10 seconds
- ☐ 10 – 20 seconds
- ☐ 21-30 seconds
- ☐ >30 seconds
- ☐ Other:_____

PIVC Survey v2 12.09.2016 1
AVATAR Group

Neonate/newborn outcomes

Measurements of skin health

Objectives

NEONATAL SKIN RISK ASSESSMENT SCALE (NSRAS)

					Score
General Physical Condition	**4. Gestational age < 28 weeks**	**3. Gestational age > 28 weeks but < 33 weeks**	**2. Gestational age > 33 weeks but < 38 weeks**	**1. Gestational age > 38 weeks to postterm**	
Mental Status	**4. Completely limited** Unresponsive (does not flinch, grasp, moan, increase blood pressure, or heart rate) to painful stimuli due to diminished level of consciousness or sedation.	**3. Very limited** Responds only to painful stimuli (flinches, grasps, moans, increased blood pressure or heart rate).	**2. Slightly limited** Lethargic.	**1. No impairment** Alert and active.	
Mobility	**4. Completely immobile** Does not make even slight changes in body or extremity position without assistance (e.g., Pavulon).	**3. Very limited** Makes occasional slight changes in body or extremity but unable to make frequent changes independently.	**2. Slightly limited** Makes frequent though slight changes in body or extremity position independently.	**1. No limitations** Makes major and frequent changes in position without assistance (e.g., turn head).	
Activity	**4. Completely bed-bound** In a radiant warmer with a clear plastic "saran" tent.	**3. Limited bed bound** In a radiant warmer without a clear plastic "saran" tent.	**2. Slightly limited** In a double walled isolette.	**1. Unlimited** In an open crib.	
Nutrition	**4. Very poor** NPO on intravenous fluids.	**3. Inadequate** Receives less than optimum amount of liquid diet for growth (formula/ breast milk) and supplemented with intravenous fluids.	**2. Adequate** Is on tube feedings, which meet nutritional needs for growth.	**1. Excellent** Bottle/breastfeeds every meal which meets nutritional needs for growth.	
Moisture	**4. Constantly moist** Skin is moist/damp every time infant is moved or turned.	**3. Moist** Skin is often but not always moist/damp; linen must be changed at least once a shift.	**2. Occasionally moist** Skin is occasionally moist/damp. Requiring an extra linen change approximately once a day.	**1. Rarely moist** Skin is usually dry, linen requires changing only every 24 hours.	

If score ≥ 13 begin infant on Standard of Care of Neonate at risk for skin injury.

THE GOAL

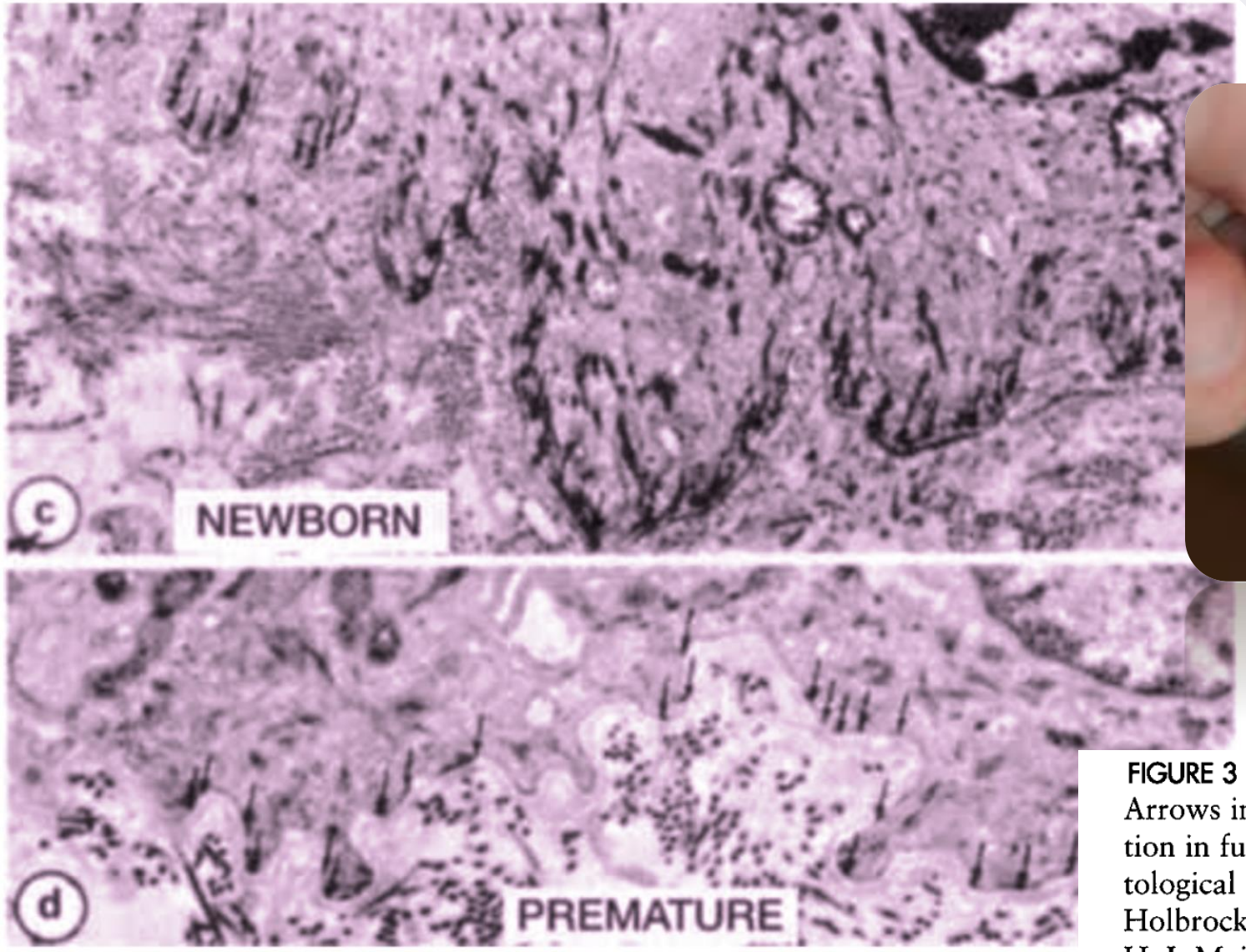


FIGURE 3
Arrows indicate anchoring fibrils at dermo-epidermal junction in full-term and premature infants. *Note*. From "A Histological Comparison of Infant and Adult Skin," by K. A. Holbrock, 1982. In *Neonatal Skin, Structure and Function*, H. I. Maibach and E. K. Boisits (editors) (p. 12). Reprinted courtesy of Marcel Dekker, Inc.

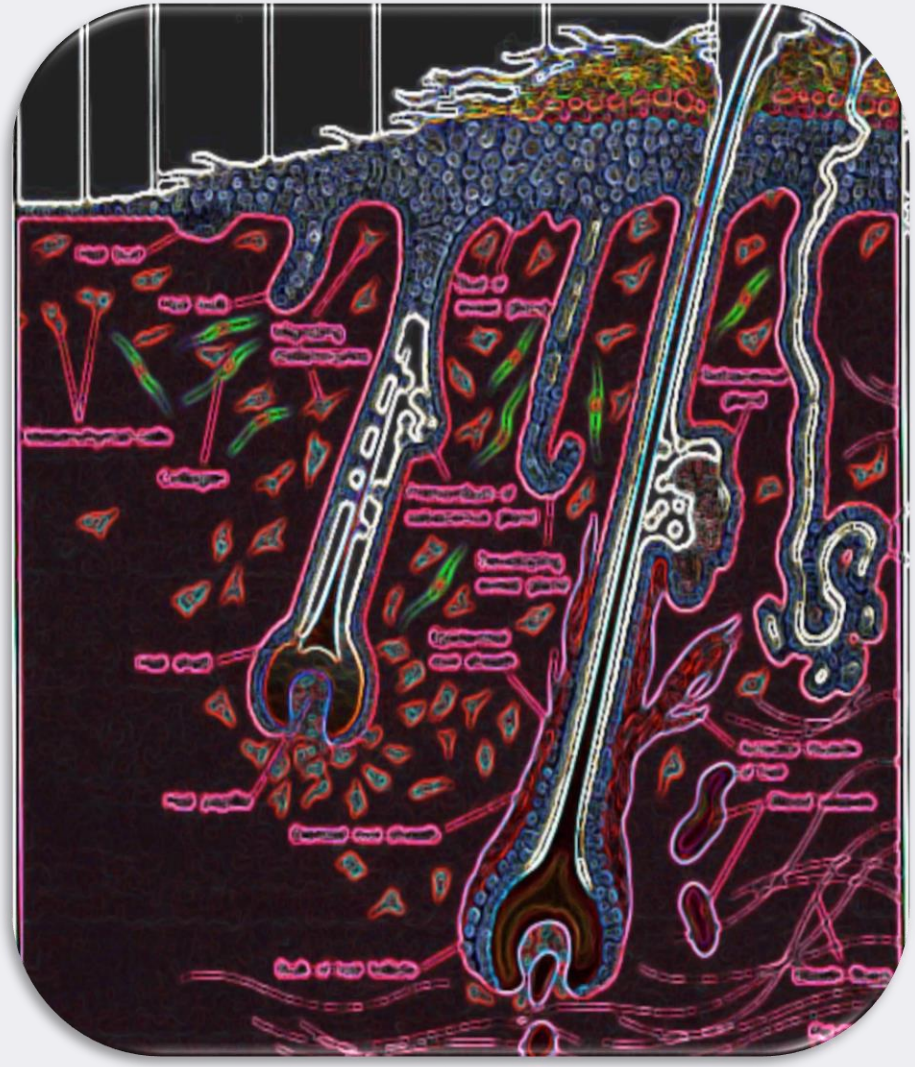
NIPIRA Study

- Evaluate
  - Kidneys
    - Creatinine
    - Urine output
  - Lungs
    - Minute/Tidal volumes
    - Oxygenation
  - Heart
    - Heart rate, Perfusion
    - Echocardiogram, Electrocardiogram
  - Skin
    - Visual assessment
    - Trans Epidermal Water Loss, pH

HEALTH, FUNCTIONALITY & MATURITY

Skin

- **TEWL-Trans Epidermal Water Loss**
- Visual assessment



TEWL

Hey, Wu, Farnroff (1970)
Rutter and Hull (1979)

- g/m^2 of water loss various gestational ages
- 4hours, 4 days, 3 weeks of life
- 18 anatomical sites
  - Abdomen highest water loss <30 weeks
- Thermoregulation & volume of fluid losses

Harpin & Rutter (1983), Kalia et al. (1998)

- TEWL, term ≤ adult ➔ mature

Lund & Kuller (1997)

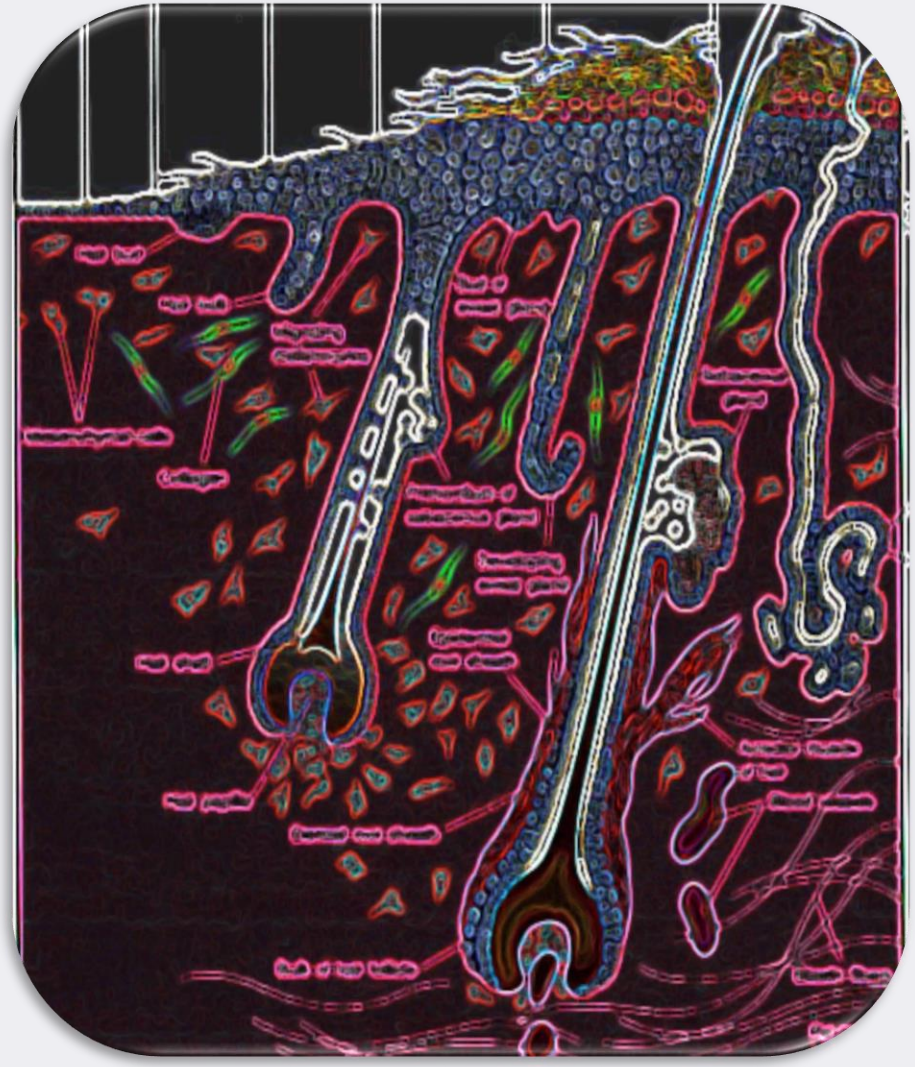
- Tape removal sites
  - ⇧ TEWL (pectin & plastic)

EVALUATION OF HEALTH

Skin

- TEWL & More
- Visual assessment

NIPIRA Study



Skin health

Hoeger et al. (2002)

- pH, skin desquamation, stratum corneum hydration, surface texture (n=202, term)
- 3 day, 4 weeks, 12 weeks , 4 anatomical sites
- Differences in skin apparent in first 3 months

Nikolovski & Stamatas (2008)

- 124 infants (3-12 months)
- water holding properties & transport differed

Fluhr et al. (2010)

- Doppler measure for perfusion
- TEWL term ≠ preterm ≠ < 25 weeks
  - < 25 weeks (longer development)
- (2014) electron microscope
  - Low surface acid ➔ ↓stratum corneum cohesion

EVALUATION OF HEALTH

Skin

- TEWL, pH
- **Visual assessment**

Lund et al. (2001, 2004)
NSCS – Neonatal Skin Condition Score
Lund et al. (1986)

Dryness-
Intact
1- normal, no dry skin
2- dry skin, visible scaling
Dry/flaky
3- very dry, cracking/fissures

Erythema
Reddened
1- no erythema
Excoriated
2- visible erythema < 50% of body surface
3- visible erythema > 50% of body surface

Breakdown/excoriation
1- none evident
2- small localized areas
3- extensive

Perfect score = 3, worst score =9

68.7%-85.4% (intrarater) and 65.9%- 89% (interrater)

Skin

- TEWL
- **Visual assessment**

Dryness

Score	Description	Area
0	None	---
0.5	Slight powderiness	< 10%
1.0	Slight powderiness or early cracking	10-50% or < 10%
1.5	Slight powderiness or early cracking	>50% or 10-50%
2.0	Early cracking or moderate cracking & scales	> 50% or < 10%
2.5	Moderate cracking & scales	10-50%
3.0	Moderate cracking & scales	>50%
3.5	High cracking & lifting scales	10-50%
4.0	High cracking & lifting scales	>50%
4.5	Bleeding cracks	10-50%
5.0	Bleeding cracks	>50%

Rash

red

attered, over ≥1

10-50%

> 50%
us

eas, numerous,

Children's Hospital

Visscher M. A Practical Method for Rapid Measurement of Skin Condition. *Newborn and Infant Nursing Reviews.* 12//2014;14(4):147-152.

SKIN INTEGRITY INTERVENTIONS

Moisture Agents

Humidity

Cleansing

Prevention of harm

SKIN INTEGRITY INTERVENTIONS

Emollients | **Oils**

Moisture Agents

Cleansing

- Low alcohol %
- ↓ Povidone-iodine
- Chlorhexdine (antimicrobial)
- ↓ Contact time

- ‘Gentle’
- Odorless/colorless
- Amount

	NIPIRA Study
Lund et al. (2001)	
Darmstadt et al. (2005)	
Aquaphor ⟷ Sunflower seed oil • Nosocomial infection • No increased rates of infection	**Bangladesh**
Prospective evaluation of skin care bundle & outcomes	
Cooke (2011)	
Conner et al. (2003)- Cochrane Review **Infant Massage & Oil for skin care**	**UK**
Ointment & Emollients for preterm skin	
• (2014) Protocol for trial >37 weeks • Aquaphor and Eucerin	
Danby et al. (2013)	
• Paraffin - TEWL • Skin conditions improved (TEWL)	
Olive oil ⟷ Sunflower seed oil • Coagulase Negative Staph increased • **Adults, 4 weeks**	**UK**
• **TEWL loss = tape stripping** • **↓ Stratum C. thickness**	
Salam et al. (2015) RCT **Nangia et al. (2015) RCT**	
Coconut oil and control for colonization • **751gm- 1499g** • **TEWL, skin swabs, skin condition score without ↑ infection**	**Pakistan** **India**

SKIN INTEGRITY INTERVENTIONS

NIPIRA Study

Humidity

- **<30 weeks 60-80 %**
- **Wean day 7 & stop at day14**
- **Born <25 weeks keep 4 weeks**

Moisture Agents

Cleansing

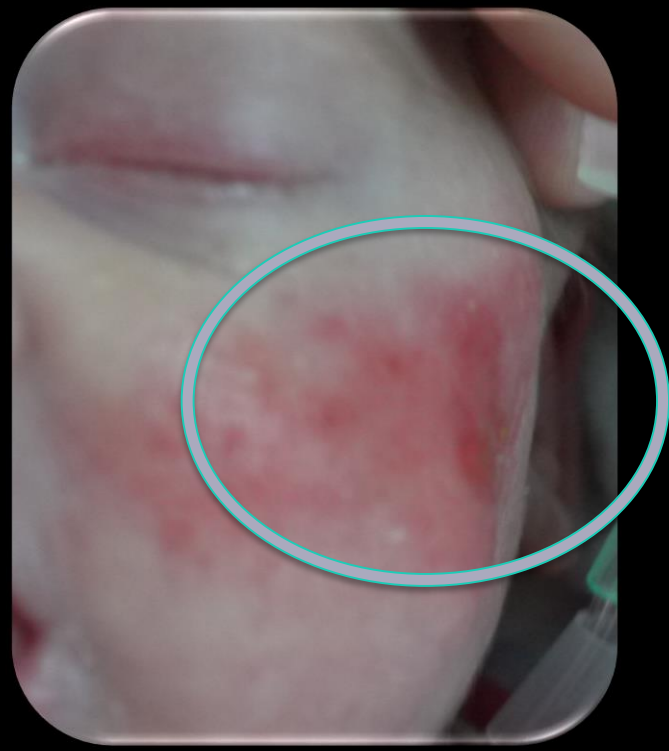
Prevention of harm

Dermatologic

- Collodion
- Infection
  Scalded Skin
- Genetic
  Epidermolysis bullosa
- Benign
  Erythema Toxicum

Iatrogenic

- Pressure
- Epidermal Stripping
- Dermatitis
- Burn
- Extravasation
- Delivery/Birth Injuries



Frequency & Severity

DEPTH

REDNESS

SKIN INJURIES

NIPIRA Study

- Skin Injuries
  - Pressure
  - Epidermal Stripping
  - Dermatitis
  - Burn
  - Extravasation
  - Delivery/Birth Injuries

SKIN INJURIES

- Skin Injuries
  - Pressure
  - Epidermal Stripping
  - Dermatitis
  - Burn
  - Extravasation
  - Delivery/Birth Injuries

DERMATITIS

BURNS

Skin Injuries

- Pressure
- Epidermal Stripping
- Dermatitis
- Burn
- Extravasation
- Delivery/Birth Injuries

Walker et al. (2009)

n= 43, extremely preterm infants
n= 44, matched term controls
Follow up at 11 years

20 mild scaring
11 Moderate procedural investigation
12 Scars from surgery

Differences in thermal sensitively but not mechanical sensitivity

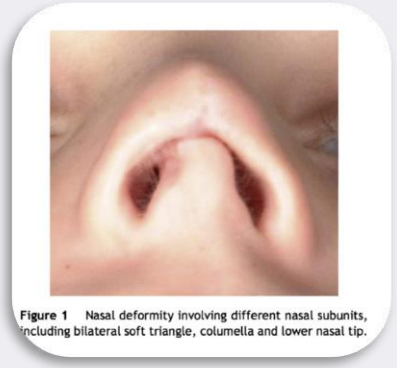


Figure 1 Nasal deformity involving different nasal subunits, including bilateral soft triangle, columella and lower nasal tip.

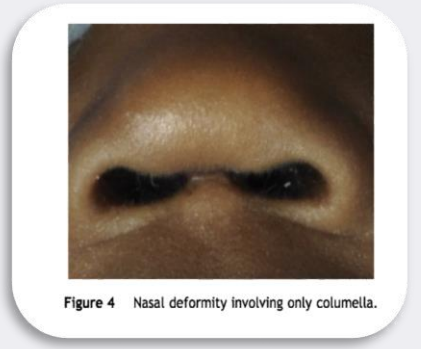


Figure 4 Nasal deformity involving only columella.

Li et al. (2015)

n=11 13.9 ± 4.6 years
(born 25.6 ± 1.6 weeks)

Nasal deformities:

- Nostril asymmetry
- Collumellar asymmetry (septum)
- Nasal tip deviation
- Airway obstruction

OUTCOMES

Yong (2005)

n=89 (28.9 ± 2.3- 29.7 ± 2.5 weeks)

n=12/41 (29%) mask

n= 17/48 (35%) prongs

- Length of time of CPAP (adjusted odds ratio 1.04, 95% CI 1.01–1.07, p = 0.003)
- No statistical difference between gestational age or use of mask/ prongs

Fischer (2010)

n=4120/989

Pressure Ulcer Advisory Panel Staging- 3 stages (stage 4 not used)

- Born < 1500grams (OR 2.28, 95% CI 1.43 to 3.64)
- Nasal CPAP was used > 5 days (OR 5.36, 95% CI 3.82 to 7.52)
- Unit was >14 days (OR 1.67, 95% CI 1.22 to 2.28)

Newman (2014)

n=78 (<1500 gm)

n= 35, mask

n= 21, prong

n= 22, rotation

NSCS- Lund (2004)

- Rotation group had best skin scores
- Risks included days on CPAP (p<0.001)
- Current gestational age (p=0.006)

Günlemez (2014)

n= 179

n= 87 Silicone gel

n= 92 control

Injury control– 13 (14.9%)

Injury gel- 4 (4.3%)

Necrosis higher in control

Bleeding

Crusting

Excoriated

Necrosis

NIPIRA Study

Collins (2014)

n= 132 (<32 weeks)

n= 67 HHF + whiskers

n= 65 NCPAP

n= 32 whiskers

n= 33 cannualaide

0-Normal

1-Pink/ red

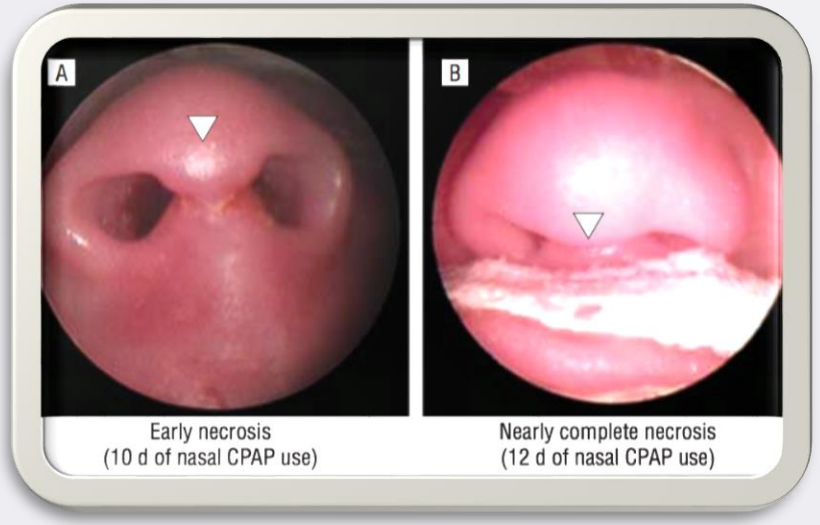
2- bleeding/ulcer/scab

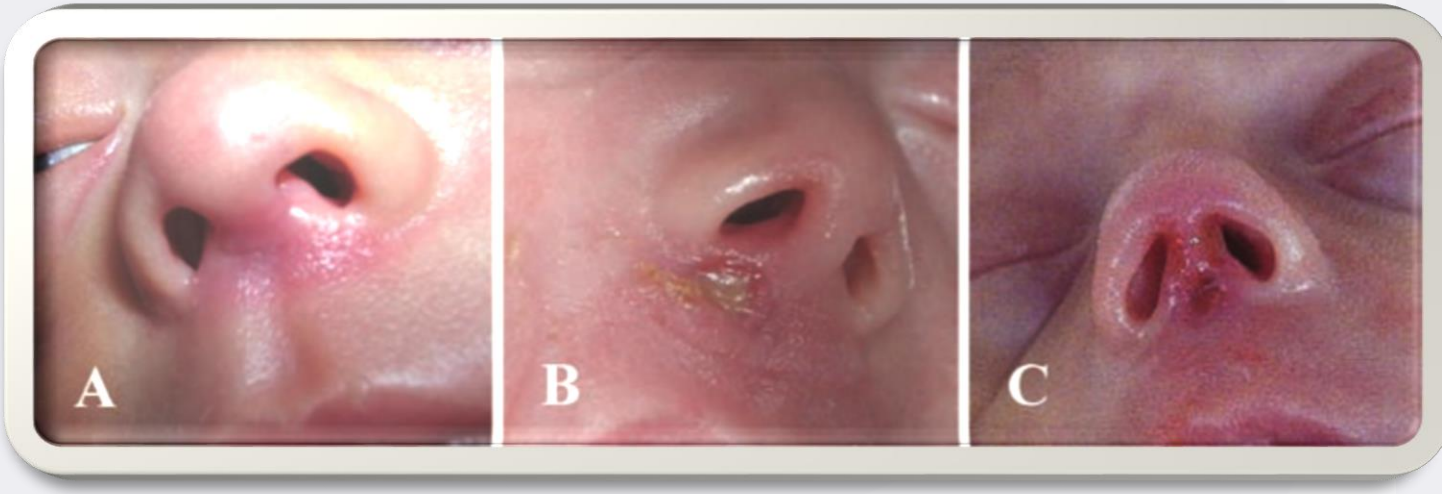
3-skin tear

- HHF + whiskers= less injury in 7 days post extubation
- No difference in trauma scores
- Trauma score 2.8 (SD 5.7) or 11.7 (SD 12.5), p <0.001
- Wiskers 14.4 (SD 12.5) or Cannualaide 9.5 (SD 7.3), p=0.006

Nasal Prongs vs. Masks & role of layers

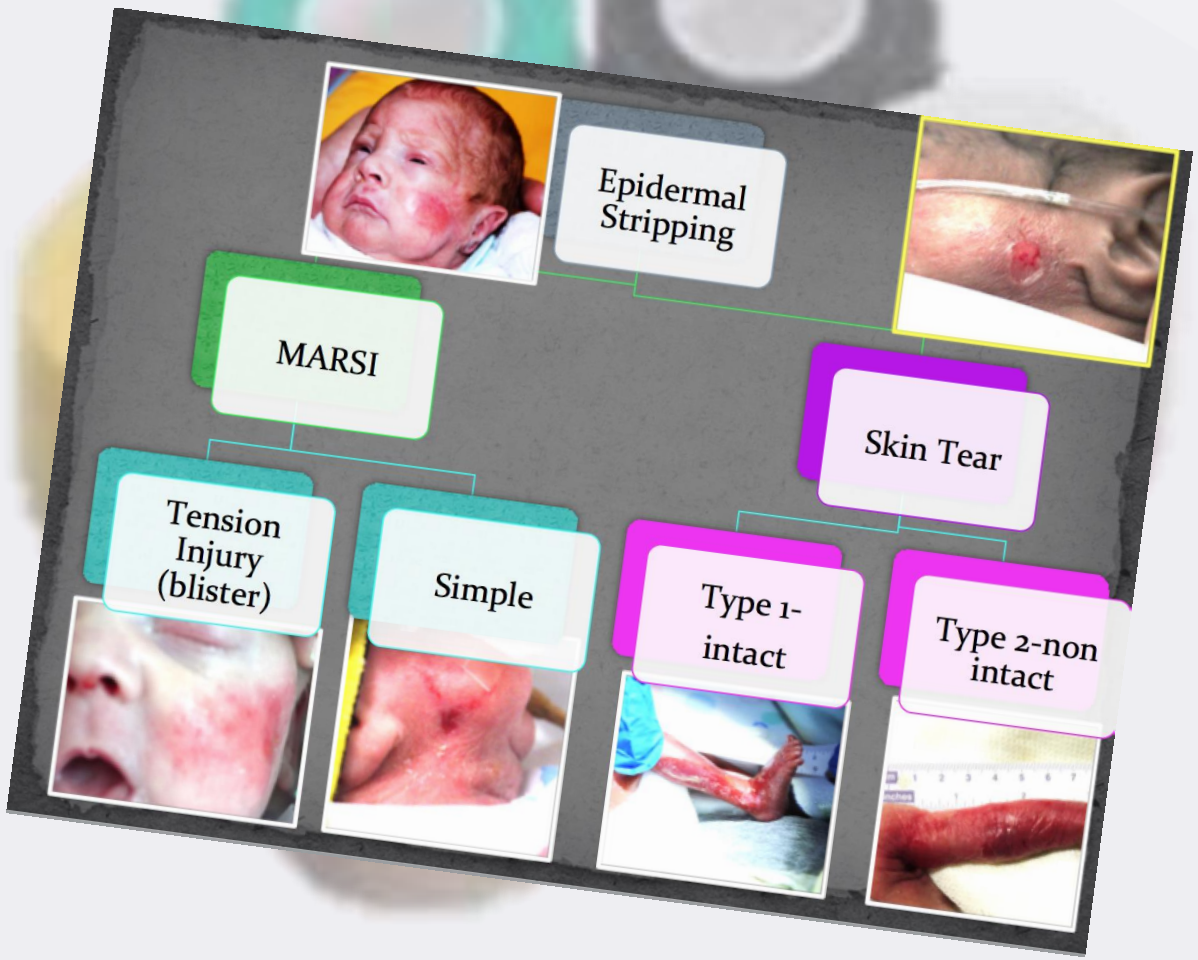
Janata et al. (2010)





Fischer et al. (2010)

Dollison and Beckstrand 1995
Case control- pectin vs. adhesive
4/20 R pectin vs. 13/20 R tape 3/20 E tape 20 neonates (28-33 weeks)
I- intact/moist D- dry R- red intact E- excoriated Lund et al 1986



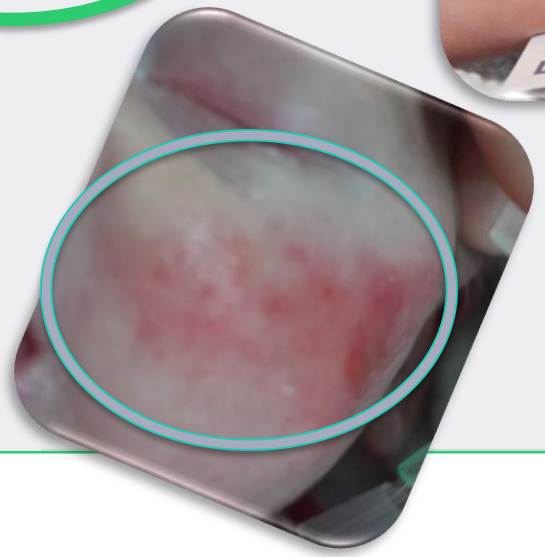
Lund et al. 1997
Control site vs. 3 adhesives: plastic, pectin, gel
Pectin and plastic significantly worse measurements 30 neonates (26- 40 weeks)
Irritation/Stripping scales +TDWL and colorimeter measurements

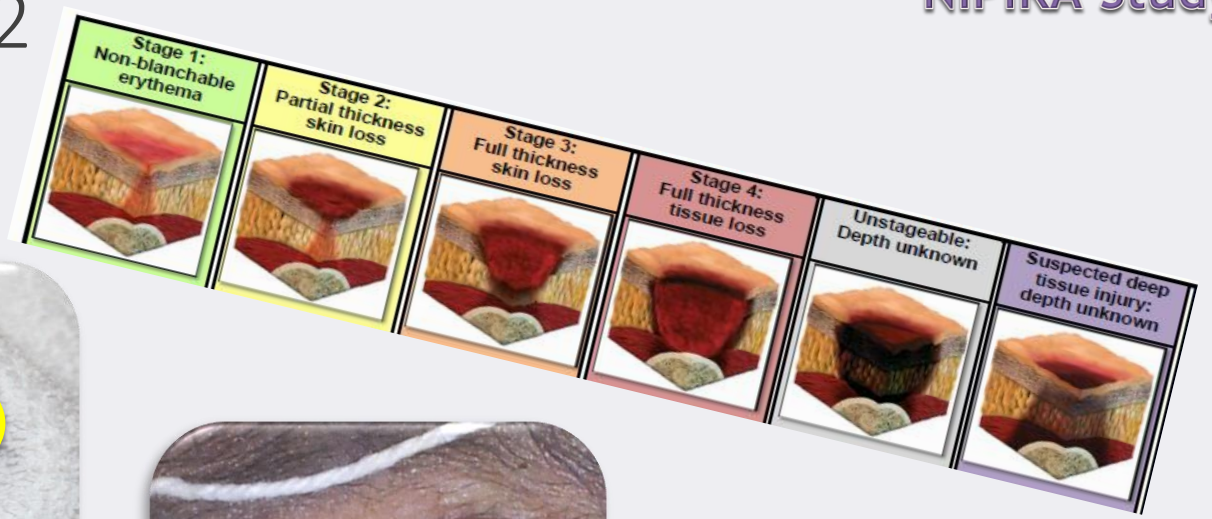
DEPTH

REDNESS

NEONATAL SKIN AUDIT 2010-2012

NIPIRA Study





NIPIRA Study

Neonatal Skin audit cohort

2 years: 247 patients

No injury occurred

n=170

Injuries occurred

n= 77

(107 injuries)

Mean birth weight : 1155g

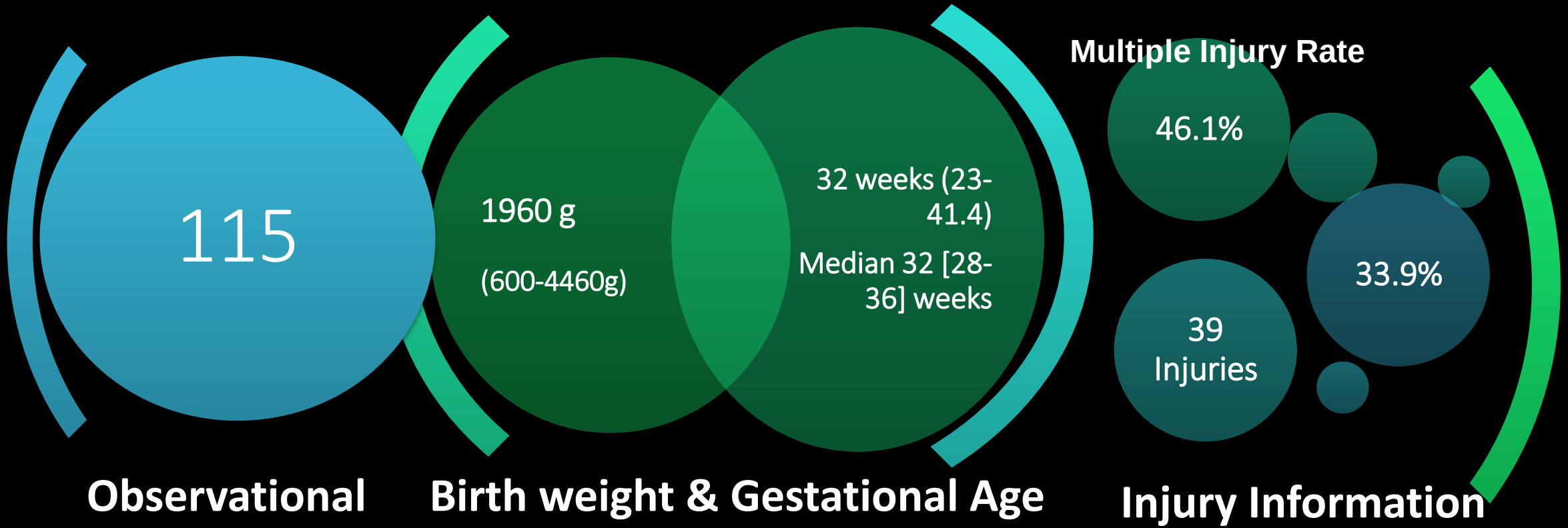
(range 445-2678g, SD 620g)

Gestation: 28 weeks

(range 22-41 weeks, SD 4.1)

PROSPECTIVE (DAILY REPORTS OVER 9 MONTHS)

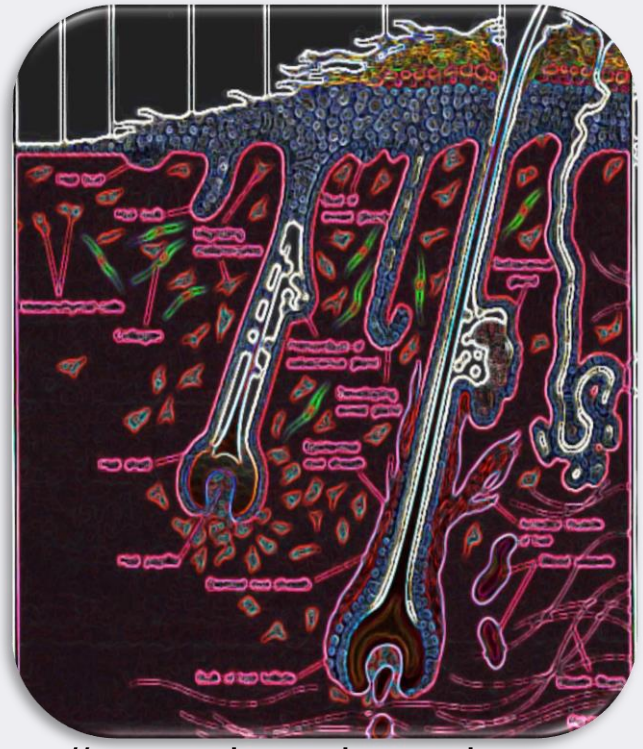
NIPIRA Study

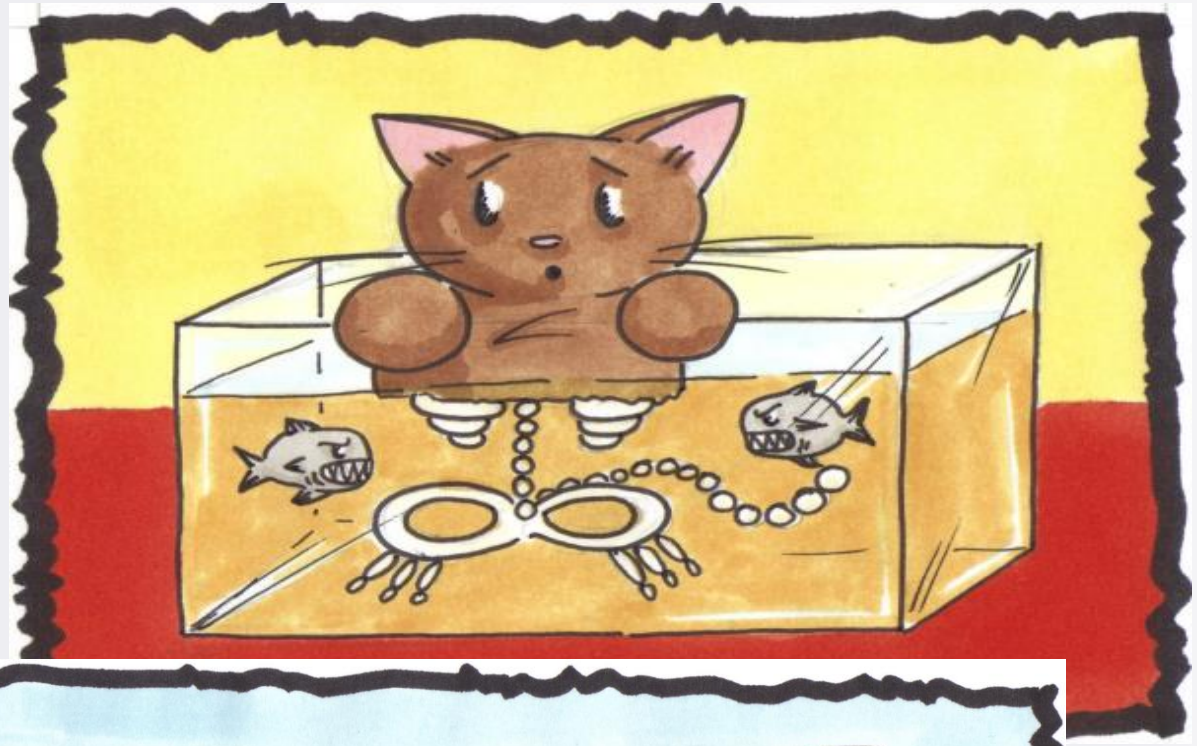


Weeks of Age	1st Week	2nd Week	Older
Stages 1-4	16	2	9
Stripping	6	4	1
2nd Injury	9	2	7

PILOT OUTCOMES

Skin Assessment for measureable outcomes





https://catatoniccomic.wordpress.com/tag/cartoon/

NEONATAL SKIN RISK ASSESSM

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