Preterm Infant Incubator Humidity
A Systematic Review

Laurie Glass, CRNP, NNP-BC, DNP
UPMC Magee Hamot Womens Hospital NICU

Background

- Preterm infant incubator humidity dates back to the 1930s
- In the 1950s, Silverman and Blanc revealed that preterm infants in high humidity had a lower death rate vs preterm infants in low humidity
- As younger preterm infants survived, transepidermal water loss (TEWL) and fluid balance challenges were studied
- Incubator humidity was most influential on TEWL in preterm infants (3)
- Although 75% relative humidity effectively reduced TEWL during the first days of life, this environment was suggested to prolong skin barrier maturation in preterm infants (1)

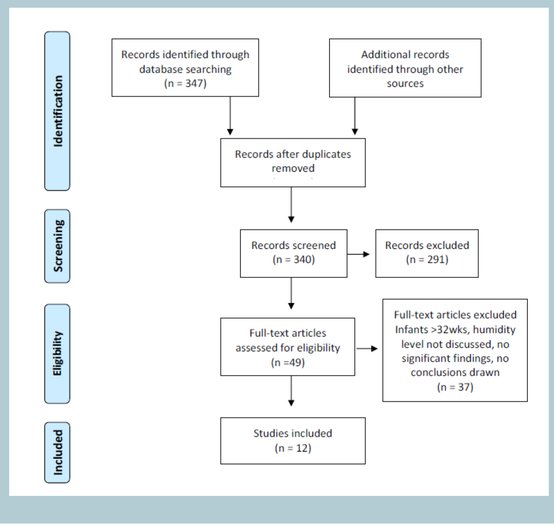
Introduction

- Incubator humidity is an inconsistent practice in the NICU
- The gap in practice recognized was the lack of standardized incubator humidity levels in the NICU
- The practice-focused question was: In premature infants < 32 0/7 weeks gestation, what impact does incubator humidity level and duration have on patient outcomes
- Closing this gap in knowledge assists neonatal providers in determining the optimal amount and duration of incubator humidity
- This synthesis of incubator humidity related outcomes assisted the formation of incubator humidity policies so that standardized practices can be created

Methodology

- A comprehensive search of the literature using 8 databases
- Search terms were *incubator, humidity, humidification*, *neonate, newborn, neonatal intensive care, preterm, premature,* and *infant*
- Joanna Briggs Institute approach provided a rigorous process that ensured critical appraisal and synthesis
- Mefford's theory of health promotion for preterm infants was used as the foundation
- Johns Hopkins levels and quality of evidence was the method of appraisal

Flow Chart



Findings

Skin-to-Skin Care

- The evidence revealed that infants < 28weeks maintained their temperature when skin-to-skin with the mother in the first days of life p =0.011 (8)
- Preterm infants < 27 weeks had increased insensible water loss of 1 g per kg during skin-to-skin care outside the humidified incubator (7)

Infection and Risks

- Microbe growth (p =0.002) and airborne volatile compounds (p <0.0006) are increased as incubator humidity is increased (4,9)
- Neonatal infections and death have been linked to contaminated incubator humidity chambers (5)

Dermatology

- Extremely preterm infants have a rapid skin barrier formation within 5 days of life with full stratum corneum maturation occurring between 2-9 postnatal weeks (2)

Recommendations

- The evidence concluded that skin barrier formation and maturation of the stratum corneum is nearly complete by 32 weeks gestation (2), offering the implication to limit incubator humidification for infants born < 32 0/7 weeks gestation
- Studies concluded that removing the infant from the humidified incubator for skin-to-skin with the mother was a safe practice during the first few days of life (7,8)
- This dissertation was published (6)
- A article has been submitted to Advances in Neonatal Care
- Below is the Incubator Humidity Guidelines developed from this review for UPMC Magee Hamot Womens Hospital NICU

Incubator Humidity Table for Infants < 32 0/7 Weeks Gestation

Day of Life	Humidity Level
1	70%
2	70%
3	70%
4	70%
5	70%
6	70%
7	70%
	*Change incubator
8	65%
9	60%
10	55%
11	50%
12	50%
13	50%
14	50%
	Discontinue humidity and change incubator*

For extremely premature infants and those exhibiting significant insensible water loss, consider increasing initial humidity level

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