

# Reducing Morbidities in Neonates Undergoing MRI Scanning

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## Introduction

Neonates undergoing MRI scanning need to remain motionless for significant lengths of time in a challenging thermal environment to achieve high resolution images. A standard practice at our institution had been the administration of deep sedation and/or general anesthesia for NICU infants undergoing MRI scanning. Following a significant cluster of hypothermia cases in 2011, we assembled a multi-disciplinary team and began a QI/QA initiative.

## Aim

To eliminate hypothermia and reduce other morbidities associated with deep sedation and/or ventilation of infants during MRI scans

## Sample/Setting

Our clinical unit is a Level IV regional NICU with outborn infants accounting for 40% of annual admissions. All infants admitted to the Penn State Hershey NICU requiring MRI scans were included in this QA project (see Table 1 for sample characteristics).

## Methods

### Phase 1, Pre-implementation Phase

An anesthesia team tracked body temperature and other data related to MRI scanning of infants and children from December 2009 - March 2011. Practice changes were limited to vigilant temperature monitoring, keeping the baby warm before going into and coming out of the scanner, increasing awareness and developing a practice advisory.

2011 - A multi-disciplinary team comprised of Anesthesia, Radiology, Neonatology and institutional QI facilitators met to specifically examine MRI issues pertaining to NICU patients. This team performed root cause analysis of hypothermia cases.

**Table 1. Sample Characteristics for Infants at Time of MRI Scan**

Characteristics	N	Minimum	Maximum	Mean	SD
Infant GA (wks)	80	28.57	43.57	37.0	2.30
Weight (kg)	80	0.70	4.60	3.18	0.55

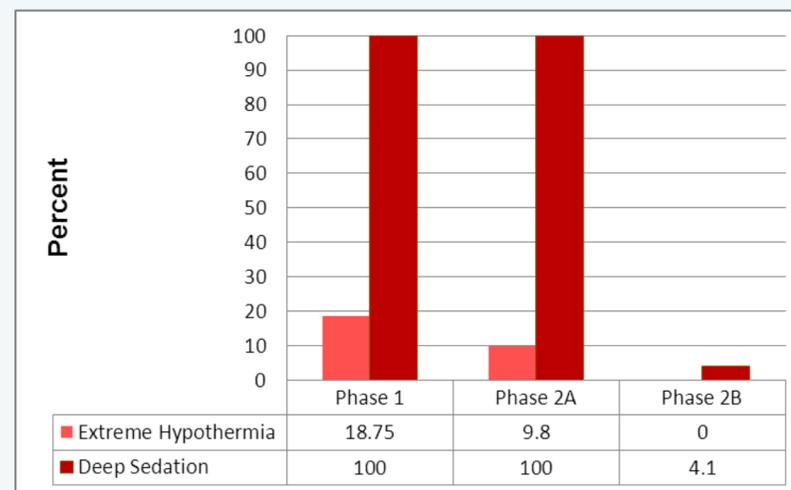
## Results

### Phase 2, Implementation Phase

#### Phase 2A - February 2012 – February 2013

Recommended changes that were implemented: tracking body temperature throughout the transport and scanning process (including constant monitoring during scan with purchase of new MRI compatible monitors with temperature monitoring capabilities), use of transport incubator, assuring proper equipment available in radiology area, turning off cooling fan in MRI magnet, revising the practice advisory and creation of algorithm to guide action in the event of extreme hypothermia during scanning. An MRI compatible vacuum restraint system (MedVac®) was purchased after creating guidelines for its use and providing appropriate training of staff.

Phase 2B - March - September 2013 The MedVac® vacuum device is now used by our team as a method of maintaining core body temperature and has virtually eliminated the need for heavy sedation and intubation during MRI scanning in NICU babies. We have also reduced our average total scan time by 25 minutes.



**Figure 1: Extreme Hypothermia and Deep Sedation Cases**

This figure depicts results for the 3 phases showing a reduction in extreme hypothermia (31.5- 35.8° C) and the need for deep sedation.

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## Discussion

Prior to the implementation of this QA/QI project, extreme hypothermia was a serious problem among neonates who traveled from the protective thermal environment of the NICU to the MRI suite. In addition, it was common practice to intubate and use deep sedation in infants undergoing MRI scans in order to achieve high quality images. With the implementation of the MedVac® vacuum restraint system, none of the infants returned from MRI with extreme hypothermia. In fact, all infants had post-scan temperatures between 36.2- 37.5°C. The vast majority (96%) of infants did not require intubation or deep sedation, thus eliminating complications such as ET tube malposition, inappropriate ventilation or arterial desaturation. Our average total scan time was reduced by 25 minutes, thus improving staffing as well as patient safety.



## Selected References

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