BACKGROUND
Hypo- or hyperthermia in neonatal intensive care unit (NICU) patients is associated with negative outcomes. Specifically, perioperative hypothermia has been associated with coagulopathies leading to increased transfusion requirements. Our NICU staff identified several babies who had returned from the NICU hypothermic after a procedure under anesthesia. A multidisciplinary team including staff from the NICU, operating room (OR), and experts in quality improvement and lean sigma were brought together to investigate contributing factors for neonatal hypothermia and develop a prevention plan. The group created a protocol and checklist containing interventions to prevent perioperative hypothermia. A pilot study showed that these initial interventions reduced the incidence of hypothermia, but that use of the checklist was inconsistent. We extended the study with the hypothesis that babies were less likely to be hypothermic if the transport thermoregulation checklist was used.

METHODS
OR-NICU Transport Temperature Checklists (Fig. 1) were stocked in multiple locations in the NICU. The nursing staffs in the NICU and OR, and the anesthesia staff were educated by nursing and anesthesia leaders via meeting presentations and email on the utilization of the protocol and checklist. NICU patients who underwent procedures under anesthesia from July to December 2012 were identified using completed checklists and data from our electronic anesthesia database. If 90% of checklists were not returned after a period of approximately two weeks, the staff was again reminded to use and return the checklist for all patients undergoing procedures with general anesthesia outside of the NICU. In addition to the data collected from the checklists, demographic information and the pre-, post- and intraoperative temperatures were obtained from the electronic anesthesia record and electronic medical record. Normothermia for this study was defined as an axillary temperature between 36.5°C and 37.5°C. Axillary temperatures out of the normal range were confirmed by rectal temperature.

RESULTS
Eighty NICU patients were identified to have undergone a procedure under anesthesia during the 6-month study period. Four were excluded from the study: three had patent ductus arteriosus ligations performed in the NICU and one was made comfort care after return to the NICU and a postoperative temperature was not recorded. Of the remaining 76 patients, 54% were normothermic, 28% were hyperthermic, and 18% were hypothermic. The checklist was completed in 29 patients (38%). Figure 2 shows the impact of checklist use on postoperative temperature. When the checklist was used, the relative risk of normothermia was 1.36 (p=0.52, 95% CI 0.53-3.46), hyperthermia 3.54 (p=0.04 95% CI=1.05-11.89) and hypothermia 0.38 (p=0.11, 95% CI=0.12-1.25) (Fig. 3). The NICU and OR staffs were reminded about completion of the checklist on three occasions after the initial education in July 2012.

DISCUSSION
Our OR-NICU Transport Temperature Checklist significantly impacted the number of patients returning to the NICU hypothermic. When the checklist was used, babies returning to the NICU after anesthesia were less likely to be hypothermic. Limitations of this study are the small sample size and inconsistent use of the checklist. Future studies are planned to investigate barriers to using the OR-NICU Transport Temperature Checklist and the impact of repeated checklist use over time on deviations from normothermia.

REFERENCES