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ORIGINAL ARTICLE

Effectiveness of a measure program to prevent admission hypothermia in very low-birth weight preterm infants☆,☆☆

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KEYWORDS
Hypothermia;
Very low birth weight infant;
Quality of health care

Abstract
Objective: To evaluate the effectiveness of a thermoregulation bundle for preventing admission hypothermia (AH) in very low-birth weight preterm infants.
Methods: Interventional study with retrospective evaluation of data undertaken in a tertiary neonatal unit including all very low-birth weight preterm infants (<1500 g) born at and admitted to the unit. Two periods were compared: before intervention (PI; 01/01/2012 to 02/28/2014) and after intervention (PII; 04/01/2014 to 11/30/2016). The intervention started in March 2014. At PI procedures in the delivery room were: placement in a crib with a radiant heat source, doors always closed, polyethylene body plastic bag, double cap (plastic and cotton mesh), room temperature between 24 to 27 °C and transport to neonatal unit in a pre-heated incubator (36–377 °C). At PII, there was a reinforcement on not opening the plastic bag during the entire resuscitation process, even at an advanced stage, and the anthropometric measures and routine care were performed in the neonatal unit. Maternal, delivery, and neonatal variables were compared. AH was considered when admission axillary temperature was <36.07 °C. Periodic results were shown to the team every six months and results were discussed.
Results: The incidence of AH was reduced significantly in PII (37.2 *vs.* 14.2%, $p < 0.0001$) and admission temperature medians were higher (36.1 *vs.* 36.5 °C, $p < 0.001$). At PII, there was an

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☆☆ Study carried out at Universidade Estadual de Campinas (UNICAMP), Faculdade de Ciências Médicas (FCM); e Universidade Estadual de Campinas (UNICAMP), Centro de Atenção Integral à Saúde da Mulher (CAISM), Hospital da Mulher Prof. Dr. José Aristodemo Pinotti, Divisão de Neonatologia, Campinas, SP, Brazil.

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increase in the number of infants transported with oxygen (49.5 *vs.* 75.5%, $p < 0.0001$). No differences were observed regarding birth weight and gestational age.
Conclusion: There was a very important reduction in AH incidence and a higher median admission temperature after continued protocol implementation.

PALAVRAS-CHAVE
Hipotermia;
Recém-nascido de muito baixo peso;
Qualidade da assistência à saúde

Efetividade de um programa de medidas para prevenção de hipotermia à admissão em recém-nascidos pré-termo de muito baixo peso

Resumo
Objetivo: Avaliar a efetividade de um programa de medidas para prevenção de hipotermia à admissão (HA) em recém-nascidos pré-termo de muito baixo peso (RNMBP).
Métodos: Estudo de intervenção com coleta retrospectiva de dados em unidade neonatal terciária incluindo todos os recém-nascidos pré-termo de muito baixo peso (< 1.500 g) nascidos e admitidos na unidade. Foram comparados dois períodos: antes da intervenção PI - 01/01/2012 a 28/02/2014 e depois da intervenção PII - 01/04/2014 a 30/11/2016. O mês de março de 2014 foi o início da intervenção. Em PI as medidas em sala de parto foram: recepção em berço de calor radiante, portas sempre fechadas, uso de saco plástico corporal, colocação de dupla touca (plástico e malha) na cabeça, temperatura ambiental entre 24-27 °C e transporte em incubadora aquecida. No PII reforçou-se a não abertura do saco plástico durante toda reanimação mesmo que avançada e dados antropométricos e cuidados rotineiros realizados na unidade de internação. Variáveis maternas, de parto e neonatais foram comparadas entre os dois períodos. HA foi considerada quando temperatura axilar < 36,0 °C. Resultados parciais foram apresentados e discutidos com a equipe semestralmente.
Resultados: A incidência da HA diminuiu significativamente em PII (37,2 x14,2%, p < 0,0001) e a mediana de temperatura foi mais elevada (36,1x36,5° C, p < 0,001). Houve aumento significativo do número de crianças transportadas com oxigênio em PII (49,5 x 75,5%, p < 0,0001). Não houve diferenças para peso ao nascer e idade gestacional.
Conclusão: Houve redução acentuada de HA e melhora na mediana da temperatura de admissão hospitalar em RNMBP após implantação do protocolo.

Introduction

Newborns are prone to rapid body temperature drop through the mechanisms of convection, evaporation, conduction, and radiation. In the first 10–20 min of life, if there is no intervention to prevent heat loss, the infant's temperature can decrease by 2–4 °C.[1,2] The lower the gestational age and the birth weight, the more significant these losses are and the higher the risk of hypothermia.[3,4] This phenomenon is due to the fact that very low birth weight (VLBW) preterm infants have a relatively large body surface area, thin skin, scarcity of subcutaneous tissue, low glycogen stores, and almost absent brown fat stores, as well as the incapacity of producing tremors to generate heat and inadequate vascular control for thermoregulation.[2]

Exposure to low body temperature is directly related to higher morbidity and mortality rates.[3–5] The study by Laptook et al.[3] demonstrated that the newborns' admission temperature to the neonatal unit (NU) was inversely related to in-hospital mortality, with a 28% increase in the mortality rate per every 1 °C of decrease in the admission temperature in VLBW infants. Additionally, admission hypothermia (AH) increases the risk of late sepsis,[3] increases the rate of oxygen consumption, causes pulmonary and systemic vasoconstriction, and is associated with worsening of respiratory distress, metabolic acidosis, hypoglycemia, coagulation disorder, and peri-intraventricular hemorrhage.[2,6]

One of the major challenges in neonatology is the maintenance of normothermia from birth to NU admission. In 2011, the Brazilian Society of Pediatrics (SBP) included hypothermia prevention methods into the neonatal resuscitation program, such as maintenance of temperature in the delivery rooms between 23 and 26 °C, resuscitation under a radiant heat source, use of plastic body bag, use of double cap (plastic and cotton) on the infant's head, and transport to the NU in heated incubators. These measurements aim to maintain the body temperature between 36.5 and 37.5 °C.[7]

AH is frequently observed in NUs, even in those with advanced technological support, ranging from 31% to 90% in NU in the United States.[8] Data from the Brazilian Neonatal Research Network indicate AH rates (axillary temperature <36 °C) of VLBW infants in the 20 registered neonatal intensive care units ranging from 9% to 91% in the year 2015.[9]