

## Thermoregulation protocol implementation for newborns in surgical procedures

*Implantação do protocolo de termorregulação para recém-nascido  
em procedimentos cirúrgicos*

*Implementación del protocolo de termorregulación para recién nacido  
en procedimientos quirúrgicos*

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### ABSTRACT

**Objective:** To describe the thermoregulation protocol implementation for newborns (NB).

**Methods:** An experimental report, conducted at a neonatal unit in Salvador, Bahia, from January 2016 to January 2017. The Plan, Do, Check, Action cycle guided the construction, implementation and applicability of the protocol.

**Results:** Implementation of the protocol that allowed the reduction of adverse events due to thermal instability during surgical procedures and introduction of new technologies. Conclusion: The protocol could improve and strengthen the care practices related to safe surgery in newborns.

**Keywords:** Patient safety. Infant, newborn. Body temperature regulation. Nursing.

### RESUMO

**Objetivo:** Descrever a implantação do protocolo de termorregulação para procedimentos cirúrgicos em recém-nascido (RN).

**Métodos:** Relato de experiência, realizado em uma unidade neonatal em Salvador-BA, no período de janeiro de 2016 a janeiro 2017. O ciclo Plan, Do, Check, Action norteou a construção, a implantação e a aplicabilidade do protocolo.

**Resultados:** Implantação do protocolo que possibilitou a redução de eventos adversos por instabilidade térmica durante procedimentos cirúrgicos e introdução de novas tecnologias.

**Conclusão:** O protocolo possibilitou a melhoria e o fortalecimento das práticas assistenciais relacionadas com a cirurgia segura em RN.

**Palavras-chave:** Segurança do paciente. Recém-nascido. Regulação da temperatura corporal. Enfermagem.

### RESUMEN

**Objetivo:** Describir la implementación del protocolo de termorregulación para procedimientos quirúrgicos en recién nacido (RN).

**Métodos:** Relato de experiencia, realizado en una unidad neonatal en Salvador-BA, en el período de enero de 2016 a enero de 2017. El ciclo Plan, Do, Check, Action orientó la construcción, la implementación y la aplicabilidad del protocolo.

**Resultados:** Se pudo implementar el protocolo que permitió reducir eventos adversos por inestabilidad térmica durante procedimientos quirúrgicos y se introdujo nuevas tecnologías.

**Conclusión:** El protocolo permitió una mejora y un fortalecimiento de las prácticas asistenciales, relacionadas con la cirugía segura en RN.

**Palabras clave:** Seguridad del paciente. Recién nacido. Regulación de la temperatura corporal. Enfermería.

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## ■ INTRODUCTION

Thermoregulation is a physiological function capable of controlling and maintaining a neutral body environment. A value lower than 36.5 °C or greater than 37.5 °C is a risk factor for neonatal morbidity and mortality, since it aggravates or favors metabolic disorders, respiratory discomfort, necrotizing enterocolitis and intracranial hemorrhage<sup>(1)</sup>.

Neonatal morbidity and mortality is a worldwide concern. In 1990, neonatal deaths accounted for 37.4% of deaths below 5 years old, increasing to 41.6% in 2013<sup>(2)</sup>. In Brazil, in 2013, it accounted for 69% of infant deaths<sup>(3)</sup>.

Providing safe and quality care to reduce neonatal morbidity and mortality indicators is an ethical commitment of managers, health professionals and the scientific community. As a strategy for qualifying care and reducing incidents, WHO has defined international patient safety targets<sup>(4)</sup>.

In this study, the goal of safe surgery for the newborn (NB) was addressed, covering ideal conditions of temperature and ensuring surgical procedure away from risks and damages to health. Study<sup>(5)</sup> revealed that most preventable adverse events (AEs) occur in the operating room and are influenced by the care provided.

In the United States of America, 74% of NB presented AEs. In Brazil, AEs reaches 84% of NB in the NICU, with thermoregulation disorders being the most reported, corresponding to 29% of the total. Of these AEs, related to thermoregulation disorders, 65.9% of the NB presented hypothermia and 5.4% hyperthermia, and in most cases, hyperthermia was secondary to the attempt to correct hypothermia<sup>(6-7)</sup>.

In this sense, it is necessary to define better practices and interventions to reduce this occurrence<sup>(7)</sup>, for example, the increase of safe practices and investments of hospital institutions, through their managers and other professionals, in strategies of human resources, materials and equipment, as well as educational ones, to reduce the safety risks incidents and improve safe care for hospitalized children<sup>(8)</sup>.

Based on the understanding that patient safety is defined as the absence of avoidable harm and the reduction of unnecessary risks associated with health care to an acceptable minimum<sup>(4,9)</sup>, attention to NB thermoregulation during pre, intra and postoperative period becomes the focus of nursing care.

Therefore, as a strategy for the reduction of AE related to the thermal instability of the NB submitted to surgical procedures, we sought for the creation of a thermoregulation protocol. The quality of the nursing care allows the safety in the care, minimizing the possible AE during surgical procedures.

The literature on this subject is still scarce. Thus, this proposal becomes relevant for the health area and, particularly, for nursing, since studies about this theme make it possible

to reduce complications and promote the commitment of all those involved in the process. Thus, the objective of this study is to describe the implementation of the thermoregulation protocol for surgical procedures in the NB.

## ■ METHODOLOGY

This is an experience report developed at the NICU and Surgical Center – CC of a private hospital in the city of Salvador – Bahia. The NICU has 28 beds, with an occupancy rate of 83-95% and an average length of stay of about 14 days. Its care team is composed of 23 neonatologists (18 nurses, 04 day care workers and 01 coordination), 25 nurses (22 assistance, 01 administrative, 01 trainee and 01 coordinator), 39 nursing technicians, 15 physiotherapists, 02 phonoaudiologists, 01 psychologist, 01 clinical pharmacist and 01 social worker, as well as counting on medical specialists and surgeons (pediatric and cardiac), besides support services. This institution is a reference in the state of Bahia for neonatal surgeries, being the only Maternity in the state with International Accreditation – *Qmentum*.

The implementation of the protocol occurred from January 2016 to January 2017. The construction, implementation and applicability of the protocol had as a guideline the PDCA (*Plan, Do, Check, Action*) cycle which is shown in Figure 1. This managerial method reflects, in its four integrated and continuous steps, the basis of the philosophy of continuous improvement through planning, execution, checking and corrective action<sup>(10)</sup>.

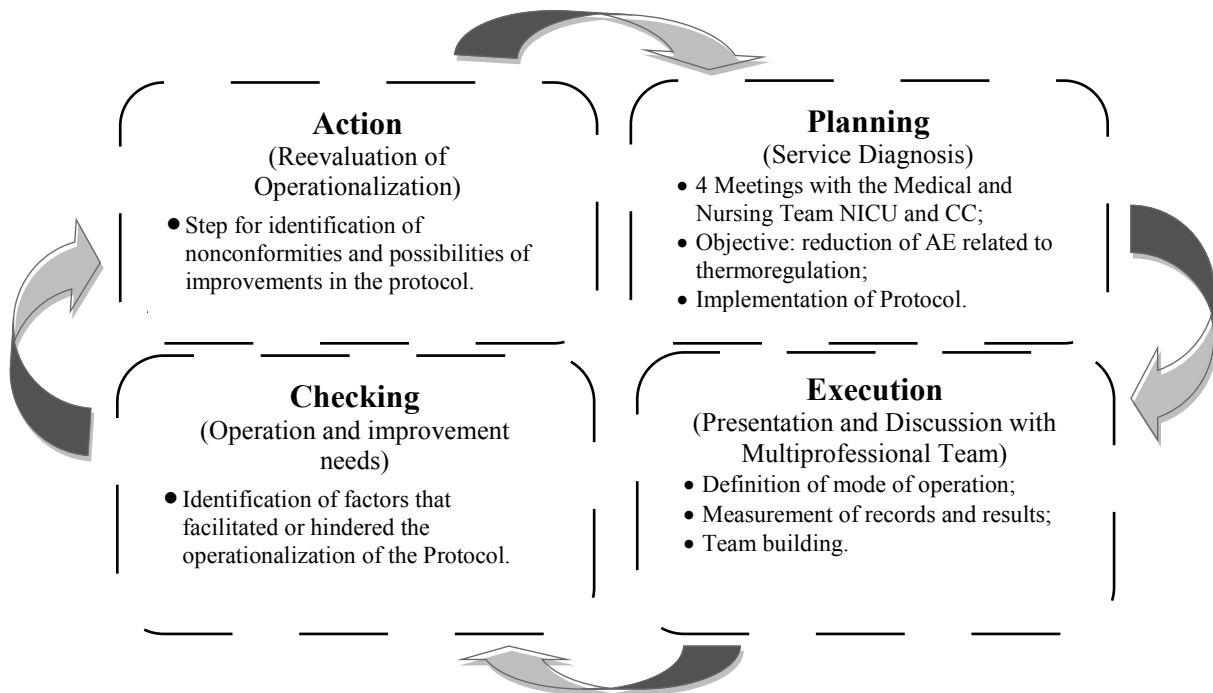
This method is presented as a continuous process cycle that does not end in the last stage and that converges to the beginning of a new cycle with a view to improving the process, in this case care/management/operation of the thermal control of the NB in procedures surgical.

## ■ RESULTS

Thermal instability during surgical procedures was defined as the most notifiable AE in NB in the institution under study. The implementation of the protocol established improvement strategies, which will be presented through the stages of the PDCA cycle.

### Planning

In order to elaborate the situational diagnosis, the indicators of AE notification were used. This instrument allowed quantifying the number and episodes of thermal instability associated with the performance of surgical procedures in NB, occurring in 2015 and 2016.



**Figure 1-** PDCA Steps Flow Chart

Source: Authors.

The meetings of the multiprofessional teams were based on the methodology of problematization<sup>(11)</sup>. The problems were launched, and the team started the discussion with reflections about the weaknesses of the service and coping strategies, brought theoretical and practical arguments to rethink the care practices, as well as the implementation of technological resources to guarantee safety and reduce hypothermia and hyperthermia in the NB.

As a proposal of actions and recommendations/routines for implementation of the protocol, the following was defined, according to Chart 1:

After elaboration of the Protocol, which was approved by the Quality Center, Hospital Infection Control Committee and Medical and Nursing Management of the institution.

### Execution

During the presentation of the protocol, the team was motivated to use the instrument. Measures of evaluation were established: internal audit of the records in the electronic medical record through a *check list* identification of care practices with the NB in surgical procedures; evaluation of risk management for surgical NB; monitoring of the AE – through a management tool, in which the coordination identified, by an electronic medical record, all NB who had episodes of hyper or hypothermia, since the

program stratified the records of all NB that presented temperature variations.

With this information, the neonatology service coordination confronted the AE notification data related to the thermal instability and guaranteed the notification and evaluation of the event. In addition, the qualitative evaluation of the AEs was performed analyzing whether these were caused by factors of assistance or related to the clinical picture of the NB.

### Checking

Step started after two months of protocol implementation. There was a low reduction in the AE index associated with the fact that the professionals were not following the protocol and were resistant to some practices. It was identified the non-incorporation of the routines: i) preheating of culls, ii) maintenance of environment with temperature between 23 - 26 °C; iii) preheating solutions and fluids; and iv) measurement of the body temperature of the NB.

### Action

Step reevaluated between four and six months of protocol implementation. The professionals were already operating the preventive measures and established routines,

presenting a reduction of 60% of the AEs related to thermal instability.

It was found that, even following the established routines, AEs were still occurring during small surgical procedures, such as catheterization.

The practices were restructured, with the introduction of the thermal blanket and bag, since, even when applying all the preventive methods, it was not possible to guarantee a safe procedure away from risks and damages to the patient.

Thus, the Nursing and Medical coordination of the neonatology department prepared an opinion with a jus-

tification about the need to implement the protocol. This opinion was based on evidence of care indicators and supported by guidelines of the Brazilian Society of Pediatrics, Ministry of Health and the WHO.

With the approval and introduction of the thermal bag and blanket as a preventive practice of thermal instability, there was a significant reduction of the AE, and the professionals were able to guarantee a safe and quality assistance to the surgical NB, reducing the neonatal morbimortality of the institution.

Actions	Recommendations / Routines
<b>To ensure environment temperature of the NICU or operating room between 23-26 °C.</b>	To control temperature with an ambient thermometer in the morning, afternoon and evening, and check it one hour before the procedure.
<b>To keep the NB with temperature sensor attached to the skin for monitoring.</b>	Before the surgical procedure, to keep sensor adhered to the skin in the right hypochondrium region and monitor thermal curve.
<b>To keep the NB engaged in previously heated culls when removing him from the incubator or heated crib for transport.</b>	To transport in previously heated incubator with temperature between 30-36 °C and later adjusted according to the need of the NB.
<b>To initiate surgical procedure only when the NB has normothermic state.</b>	To check temperature before the surgical procedure, guaranteeing normothermia (temperature of 36.5 - 37.4 °C).
<b>To insert esophageal thermometer before surgical procedure for temperature monitoring.</b>	To monitor thermal curve every 30 minutes until the end of surgery.
<b>To use thermal blanket during large surgical procedures.</b>	To monitor thermal blanket temperature according to the NB needs.
<b>To administer solutions and blood products at a suitable temperature of 36.5 °C to 37 °C.</b>	To check temperature of solutions and blood products with infrared thermometer.
<b>To monitor the temperature of the NB in the NICU after the postoperative return, with a digital thermometer.</b>	<ul style="list-style-type: none"> <li>- To continue with multi-parameter monitoring at 01-hour intervals in the first 06 postoperative hours;</li> <li>- Every 02 hours in the first 12 hours postoperatively;</li> <li>- Every 03 hours after the first 12 hours after surgery.</li> </ul>
<b>To monitor NB temperature at 15-minute intervals in situations where the condition presents hyper or hypothermia.</b>	<ul style="list-style-type: none"> <li>- In episodes of hypothermia, to adjust incubator parameter or heated crib, increasing 0.5 °C every 60 minutes.</li> <li>- In episodes of hyperthermia, to adjust parameter of incubator or heated crib, reducing 0.5 °C every 60 minutes and assess the needs of administering antipyretics.</li> </ul>

**Chart 1** - Actions and recommendations/routines for protocol deployment

Source: Authors.

## ■ DISCUSSION

Providing care to the NB, guided by the international goals of patient safety, enables improvements in care and

aims at quality in the care provided. These safe actions have been gaining increasing prominence in the world scene<sup>(12)</sup>.

Serious complications and deaths can occur during surgical procedures. Half of these complications can be

avoided with the systematic use of checklists and/or clinical protocols, since most of the preventable AEs occur in the operating room, with their relatively high rates in NB<sup>(5)</sup>.

There is increasing evidence that the implementation of checklists and protocols can potentially prevent errors and complications associated with perioperative outcomes, so these interventions are promising for improving patient safety in most health care settings<sup>(5,13)</sup>.

Hospitals are suggested to develop protocols and standardized checklists in accordance with documented guidelines, promoting cooperation between hospital units and departments, improving communication and clarifying work processes for safer care, and creating an affirmative culture that encourages error notification<sup>(14)</sup>.

Seeking continuous strategies to prevent AEs has made it possible to identify safety or quality problems at a stage where they are easily corrected. Leaving to investigate serious AEs after patients have suffered injuries means that opportunities have been lost to intervene in the hazards before they cause harm<sup>(15)</sup>.

The attribution of neonatal hypothermia to indirect or direct causes of neonatal death is complex and difficult, however maintaining a normal body temperature is a critical function for the survival of the NB<sup>(16)</sup>, since thermal instability can lead to metabolic deterioration and direct death due to hypothermia or indirect mortality, associated with severe infections<sup>(17)</sup>.

Study<sup>(18)</sup> revealed that one of the main complications that affect the NB is ineffective thermoregulation, since the NB loses heat easily as a result of evaporation and the temperature of the external environment. Thus, 50.3% of extremely low birth weight infants present episodes and complications related to hypothermia.

Canadian hospitals point out the high AEs rate that affects NB in NICU, and its highest proportion is between surgical patients when compared to clinical patients<sup>(19)</sup>, so it becomes necessary to adopt a culture of safety, in which errors can be recognized and avoided, encouraging a safe care practice<sup>(12)</sup>.

Study<sup>(15)</sup> pointed out the need for effectiveness of assistance protocols for the reduction of AE, in addition, it stimulates the involvement of the health team, especially nursing staff. It is up to these improvement teams to identify and involve people able to oversee improved processes so that they become co-responsible for the implementation of clinical protocols.

A protocol implementation strategy and surgical safety checklist focused on neonatal patients, can achieve acceptability and adherence as they can be effective when used within a comprehensive implementation strategy,

especially for high-risk patients such as NB<sup>(20)</sup>.

## ■ FINAL CONSIDERATIONS

The thermal control of the NB in a surgical procedure requires an accurate look of health professionals, and especially of the nursing team, since thermal instability interferes with the hemodynamics of the NB, has repercussions on the prognosis and increases the rates of neonatal morbidity and mortality.

The implementation of this protocol was a strategy to improve and strengthen care practices related to safe surgery in NB. This initiative represents an institutional effort that integrates multiprofessional teams, and its implementation has already made possible some innovations, such as: the establishment of safe practices based on evidence; use of thermal blanket in all surgical procedures for NB; monitoring of temperature through esophageal thermometer, among others.

The application of this protocol in a single health institution presents itself as a limitation of the study, however this fact does not make it impossible to replicate in other care services to the NB, since it translates into a positive experience and with effective improvements.

It is believed that this study, presented here, allows researchers and scholars of the area to deepen research in this area, in order to seek new methods and strategies of care with the RN in surgical procedures, and thus ensure a quality, safe and effective care, free of risks and damages, in line with international patient safety goals.

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