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ORIGINAL RESEARCH

Benefits of inserting the physical therapist on the profile of low-risk premature infants admitted to an intensive care unit

Benefícios da inserção do fisioterapeuta sobre o perfil de prematuros de baixo risco internados em unidade de terapia intensiva

Beneficios de la inserción del fisioterapeuta sobre el perfil de prematuros de bajo riesgo internados en unidad de terapia intensiva

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ABSTRACT | This study aims to describe the benefits of inserting the physical therapist on the profile of low-risk premature infants in neonatal intensive care units. This is a retrospective control study, with consultation to the medical records of premature infants admitted in 2006/2007 without physical therapy (PREP) and in 2009/2010 with physical therapy for up to 8h/day (POSTP). 61 preterm infants in the PREP period and 93 in the POSTP were included, born with ≥1000g, SNAP-PE II <40, with a duration of ventilatory support ≥24h. Maternal and neonatal profiles, duration of hospitalization, invasive and non-invasive mechanical ventilation and oxygen therapy were verified. Descriptive analysis, the Mann Whitney test, t-test, Chi-squared and Fisher's test were performed, considering p≤0.05. There was a significant difference between gestational ages [PREP: 230.5 (±16.5)/ POSTP: 226 (±15); p = 0.05], frequency of sepsis [PREP: 6 (10%) / POSTP: 30 (32%); p < 0.01], respiratory distress syndrome [PREP: 11 (18%)/POSTP: 43 (46%); p < 0.01], need for resuscitation in the delivery room [PREP: 10 (16%) / POSTP: 32 (34%); p = 0.02], need for orotracheal intubation [PREP: 8 (13%)/POSTP: 26 (28%); invasive ventilation (PREP: 0.4±1.3 days/POSTP: 1.3±3.3 days, p = 0.04), continuous positive airway pressure (PREP: 1.5±1.0 days/POSTP: 2.7±3.8 days, p = 0.04). The presence of the physical therapist generated benefits, contributing to the maintenance of the length of hospitalization and oxygen therapy in face of a profile of more immature

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newborns and with more complications in the period after physical therapy was inserted.
Keywords | Physical Therapy Modalities; Intensive Care Units, Neonatal; Infant, Premature; Case-Control Studies.

RESUMO | O presente estudo visa descrever os benefícios da inserção do fisioterapeuta sobre o perfil de prematuros de baixo risco internados em unidade de terapia intensiva neonatal. Estudo caso-controle, retrospectivo, com consulta aos prontuários de prematuros internados em 2006/2007 sem fisioterapia (PREF) e em 2009/2010 com fisioterapia por até 8h/dia (POSF). Incluíram-se 61 prematuros no período PREF e 93 no POSF, nascidos com ≥1000g, SNAP-PE II <40, com tempo de suporte ventilatório ≥24h. Verificou-se os perfis materno e dos neonatos, tempos de internação, de ventilação mecânica invasiva e não invasiva e de oxigenoterapia. Realizou-se análise descritiva, teste Mann Whitney, teste *t*, qui-quadrado e Fisher, considerando-se p≤0,05. Houve diferença significativa entre as idades gestacionais [PREF: 230,5 (±16,5)/ POSF: 226 (±15); p=0,05], frequência de sepse [PREF: 6 (10%)/ POSF: 30 (32%); p<0,01], de síndrome do desconforto respiratório [PREF: 11(18%)/ POSF: 43 (46%); p<0,01], necessidade de reanimação na sala de parto [PREF: 10 (16%)/ POSF: 32 (34%); p=0,02], necessidade de intubação orotraqueal [PREF: 8 (13%)/ POSF: 26 (28%); p=0,05], tempo de ventilação não invasiva (PREF: 0,1±0,4 dias/ POSF: 0,8±2,3 dias; p<0,01), de ventilação invasiva (PREF: 0,4±1,3 dias/ POSF: 1,3±3,3 dias; p=0,04), de pressão positiva contínua em vias aéreas (PREF: 1,5±1,0 dias/ POSF: 2,7±3,8 dias; p=0,04). A presença do fisioterapeuta gerou benefícios, contribuindo para a manutenção dos tempos de internação e de oxigenoterapia mesmo diante de um perfil de recém-nascidos mais imaturos e com mais intercorrências no período após a inserção da fisioterapia.

Descritores | Modalidades de Fisioterapia; Unidades de Terapia Intensiva Neonatal; Recém-Nascido Prematuro; Estudos de Casos e Controles.

RESUMEN | El presente estudio describe los beneficios de la inserción del fisioterapeuta sobre el perfil de prematuros de bajo riesgo internados en unidad de terapia intensiva. Estudio caso-control, retrospectivo, con prontuarios de prematuros internados en 2006/2007 (sin fisioterapia - PREF) y en 2009/2010 (con fisioterapia por hasta 8h / día - POSF). Se incluyeron 61 prematuros (PREF) y 93 (POSF), ≥ 1000g, SNAP-PE II <40, con tiempo de soporte ventilatorio ≥ 24h. Se verificaron los perfiles maternos y de los neonatos, tiempos de internación, de ventilación mecánica invasiva y no invasiva y de oxigenoterapia. Se realizó análisis descriptivo, Mann Whitney, *t*, qui-cuadrado y Fisher, considerando p ≤ 0,05. Se observó diferencia entre las edades gestacionales [PREF: 230,5 (± 16,5) / POSF: 226 (±15); p=0,05], frecuencia de sepsis [PREF: 6 (10%) / POSTP: 30 (32%); p < 0,01], síndrome de distrés respiratorio [PREF: 11 (18%) / POSF: 43 (46%); p <0,01], necesidad de reanimación en la sala de parto [PREF: 10 (16%) / POSTP: 32 (34%); p=0,02], necesidad de intubación [PREF: 8 (13%) / POSF: 26 (28%); (p=0,05), tiempo de ventilación no invasiva (PREF: 0,1±0,4 días / POSF: 0,8±2,3 días, p<0,01), ventilación invasiva (PREF: 0, 4±1,3 días / POSF: 1,3±3,3 días, p=0,04). La presencia del fisioterapeuta generó beneficios, contribuyendo para el mantenimiento de los tiempos de internación y de oxigenoterapia, aunque el perfil de recién nacidos tuvo más intercurrencias después de la inserción de la fisioterapia.

Palabras clave | Modalidades de Fisioterapia; Unidades de Cuidado Intensivo Neonatal; Recién Nacido Prematuro; Estudios de Casos y Controles.

INTRODUCTION

Neonatal intensive care units (NICU) assist preterm newborns (PTNB)[1,2] and to newborns (NB) with other needs, not always linked to prematurity[1-3].

Currently, a greater survival of NB is observed thanks to the increasingly expressive technical and scientific advances[1]. Given this context, there was an increase in length of hospitalization, and multidisciplinary teams were expanded in order to contribute with the excellence of care[2,3]. The physical therapist participated in these teams to optimize respiratory and/or motor functions, depending on the underlying disease[2]. The objectives and actions of physical therapy in NBs consider the anatomical-physiological particularities of this population, which forces the professional of the field to be increasingly specialized[1-3].

The insertion of the physical therapist in the Brazilian NICU is based on the current legislation[4-7]. Ordinance no. 3,432 determined that intensive care units (ICU) must have physiotherapeutic assistance[5]. Resolution RDC no. 7 from 02/24/2010 regulated, within the minimal requirements for the operation of ICUs, a physical therapist for every 10 beds, in the three shifts[6]. Ordinance no. 930, from 05/10/2012 defined the guidelines for organizing the care to the

NB and the criteria of classification and habilitation of NICU beds[7].

The full-time permanence of the physical therapist in NICUs can reduce complications, length of hospitalization and hospital costs[8]. However, some studies show that only partial assistance is being provided by physical therapists[9-12]. From this, it is important to verify if working hours inferior to the ones determined by legislation would be enough to change the profile of hospitalized NBs or if, in fact, the hours predicted by law are essential for a care that generates significant results.

Given this context, this study aims to describe the benefits of inserting a physical therapist on the profile of low risk premature infants hospitalized in a neonatal intensive care unit.

METHODOLOGY

This is a retrospective and analytical control-case study that was approved by the Research Ethics Committee of a public maternity in the municipality of Rio de Janeiro.

Medical records of NBs admitted in the NICU of a public maternity in two periods were included: 2006/2007 and 2009/2010, that is, periods before (PREP) and after (POSTP) the insertion of part-time physical therapy (6 to 8 daily hours on weekdays), respectively.

The search for NB medical records included the record books of the hospital and, based on the count of the total number of NBs that fulfilled the inclusion criteria in one of the years, sample calculation was performed, using power of 0.8 and significance level of 0.05, with minimum sample size of 141 charts.

Inclusion criteria were: PTNB with birth weight (BW) ≥1000g, SNAP-PE II score <40[13], invasive or non-invasive mechanical pulmonary ventilation ≥24h. PTNB with peri or intraventricular hemorrhage grade III or IV, congenital malformations, genetic syndromes, metabolic disorders and those who died before the 28th day of life.

The following maternal variables were computed: age, number of prenatal consultations, use and number of antenatal corticosteroid doses, frequency of cesarean delivery, rupture of amniotic membranes for more than 18 hours, premature labor, HELLP syndrome, urinary infection, restricted intrauterine growth, preeclampsia, gestational diabetes and systemic arterial hypertension.

Neonatal variables were: gestational age, birth weight, gender, need for resuscitation in the delivery room, Apgar index lower than 7 in the fifth minute, nutritional classification, twin pregnancy, respiratory distress syndrome (RDS), need for surfactant replacement therapy, need for orotracheal intubation (OTI) and reintubation (Re-OTI), in addition of frequency of atelactasis, bronchopulmonary dysplasia (BPD), pneumothorax, pneumonia, airway bleeding, sepsis, meningitis, alterations in the first transfontanellar ultrasound (TFUS) alteration in the echocardiogram (ECHO), length of hospitalization in and out NICU, duration of invasive and non-invasive mechanical pulmonary ventilation and of oxygen therapy.

The data description was performed, with estimation of frequencies, measures of central tendency and dispersion. Data normality was verified through the Shapiro test and, for the numerical variables, the Mann-Whitney hypothesis test and the t-test were used according to the normality of the data or not, in order to see if there were differences between the groups. For the categorical variables, the Chi-square test, the chi-square with Monte Carlo approximation and the Fisher's test were performed between the groups. The analyses were performed through the R language of the R Studio® software. The data were compared considering $p \leq 0.05$ as statistically significant.

RESULTS

154 medical records were selected, containing all the necessary information, being 61 charts from the PREP period and 93 from the POSTP. There was no statistical difference between the maternal characteristics in the studied periods (Table 1A and B).

There was a significant difference in gestational ages, lower in the 2009/2010 period, and in the frequencies of reanimation in the delivery room, OTI, RDS and sepsis, which were higher in the POSTP period (Table 2A and B). There was a significant difference between all ventilatory variables, with greater duration of support in the POSTP period. However, there was no significant difference between duration of oxygen therapy and length of hospitalization in the NICU between the two groups. The results are described in Table 3.

Table 1. Profile of the maternal sample: absolute value and frequency of binary (A) and continuous (B) variables

A					
Variable	Period				p-value
	PREP		POSTP		
	n	%	n	%	
Access to prenatal care	54	95	80	94	1,00^
Cesarean delivery	42	74	58	68	0,61#
Use of antenatal corticosteroid	37	65	65	76	0,19#
DRM ≥ 18H	10	18	21	25	0,42#
Premature labor	12	21	14	16	0,64#
HELLP syndrome	1	2	1	1	1,00^
Urinary tract infection	9	16	9	11	0,51#
RITG	2	4	5	6	0,71^
Preeclampsia	9	16	13	15	1,00#
Gestational diabetes	2	4	10	12	0,13^
SAH	6	11	7	8	0,87#
B					
Variable	PREP		POTP		p-value
	Mean (±DP)	Median	Mean (±DP)	Median	
Maternal age	26,7 (±7,1)	26	27,0 (±6,8)	27	0,78*
No. of antenatal corticosteroid doses	1,3 (±1,1)	2	1,5 (±1,0)	2	0,17‡
No. of prenatal consultations	5,6 (±2,6)	6	5,3 (±2,9)	6	0,41‡

* Test *t*; □ Mann-Whitney test; #: Chi-Squared; ^: Chi-Squared with Monte Carlo approximation; PREP: PTNB born from 2006 to 2007, without physical therapy; POSTP: PTNB born from 2009 to 2010, with physical therapist; SD: standard deviation; DRM: duration of ruptured membrane; RITG: restricted intrauterine growth; SAH: systemic arterial hypertension.

Source: Elaborated by the authors (2017).

Table 2. Profile of the NB sample: absolute value and frequency of binary (A) and continuous (B) variables

A					
Variable	Period				p-value
	PREP		POSTP		
	n	%	n	%	
Male	38	62	54	58	0,72#
SGA classification	15	25	21	23	0,93#
Twin pregnancy	17	28	19	20	0,38#
Resuscitation in the delivery room	10	16	32	34	0,02#
Apgar < 7 in the fifth minute	0	0	3	3	0,27^
Respiratory distress syndrome	11	18	43	46	<0,01#
surfactant	6	10	18	19	0,17#
Need for OTI	8	13	26	28	0,05#
Need for Re-OTI	0	0	4	4	0,15^
Sepsis	6	10	30	32	<0,01#
Atelectasis	3	5	4	4	1,00^
Bronchopulmonary dysplasia	0	0	3	3	0,27^
Pneumothorax	1	2	1	1	1,00^
Pneumonia	5	8	8	9	1,00#
Airway bleeding	0	0	3	3	0,29^
Altered echocardiogram	4	7	9	10	0,70#
Altered TFUS	7	11	7	8	0,58#
B					
Variable	Period				p-value
	PRE-PHYSIO		POST-PHYSIO		
	Mean (±DP)	Median	Mean (±DP)	Median	
Gestational age	230,5 (±16,5)	232	226 (±15)	227	0,05‡
Birth weight	1822,2 (±557,6)	1690	1762 (±518,1)	1710	0,49*
SNAP-PE II score	7,8 (±8,7)	5	10,5 (±10,7)	8	0,11‡

* Teste *t*; □ Mann-Whitney test; #: Chi-Squared; ^: Chi-Squared with Monte Carlo approximation; PREP: PTNB born from 2006 to 2007, without physical therapy; POSTP: PTNB born between 2009/2010 with physical therapy; SD: standard deviation; SGA: small for gestational age; OTI: orotracheal intubation; TFUS: transfontanellar ultrasound.

Source: Elaborated by the authors (2017).

Table 3. Data related to hospitalization and ventilatory support in the PREP and POSTP periods

Duration (days)		PREP	POSTP	p-value
Oxygen therapy	Minimum	0	0	
	Median	1	1	
	Maximum	14	41	
	Mean (±SD)	2,2 (±2,6)	3,7 (±5,9)	0,31‡
CPAP	Minimum	0	0	
	Median	1	1	
	Maximum	5	30	
	Mean (±SD)	1,5 (±1,0)	2,7 (±3,8)	0,04‡
NIMV	Minimum	0	0	
	Median	0	0	
	Maximum	2	15	
	Mean (±SD)	0,1 (±0,4)	0,8 (±2,3)	<0,01‡
NIMV + CPAP	Minimum	0	0	
	Median	1	2	
	Maximum	5	45	
	Mean (±SD)	1,6 (±1,1)	3,9 (±6,6)	<0,01‡
IMV	Minimum	0	0	
	Median	0	0	
	Maximum	7	20	
	Mean (±SD)	0,4 (±1,3)	1,3 (±3,3)	0,04‡
Hospitalization in the NICU	Minimum	2	2	
	Median	13	12	
	Maximum	79	81	
	Mean (±SD)	20 (±17,7)	18,2 (±16,0)	0,39*
Hospitalization out of the NICU	Minimum	2	4	
	Median	24	26	
	Maximum	79	84	
	Mean (±SD)	27,2 (±17,4)	29,6 (±19,1)	0,77*

* Teste *t*; ‡ Mann-Whitney test; PREP: PTNB born from 2006 to 2007, without physical therapy; POSTP: PTNB born between 2009/2010 with physical therapy; CPAP: continuous positive airway pressure; NIMV: non-invasive mechanical ventilation; IMV: invasive mechanical ventilation..

Source: Elaborated by the authors (2017).

DISCUSSION

This study showed a change in the profile of PTNB hospitalized in the NICU in the two periods. In the POSTP, the NB were more immature in relation to those in the PREP. In addition, there was a higher frequency of RDS, sepsis and permanence in ventilation in the POSTP period. The length of hospitalization, oxygen therapy, frequency of reintubation and respiratory complications remained unchanged between the groups.

From the results found, it is necessary to reflect on the evidenced of the contribution of physical therapy in the NICU[14-17] and the time of practice. It is known that neonatal physical therapy assists in the prevention and treatment of respiratory complications[14-16] and contributes to airway clearance with improvement of blood gases and vital signs[14-17], without altering the cardiopulmonary and/or neurological function nor causing pain or episodes of gastroesophageal reflux[18,19]. Despite all these advantages, there is still a lack of evidences that bring the description of the profiles according to the assistance times[16], which gives this study a great relevance.

There were no differences between maternal profiles, since the mothers of NBs did not have complications that could alter the behavior of newborns during hospitalization (Table 1).

Regarding PTNB, there was a difference between the gestational ages (Table 2B), frequency of sepsis and RDS, need for OTI and of neonatal resuscitation (Table 2A). The other characteristics were similar between the groups (Table 2A and B), with a tendency to worsen in the POSTP period. Therefore, although all included NB

had SNAP-PE II score <40, the POSTP group showed more complications than PREP NBs.

Despite having increased durations of ventilatory support in POSTP (Table 3), the insertion of physical therapy generated beneficial effects, since newborns needed the same length of hospitalization to recover in the POSTP, besides not having evolved with higher rate of BPD and neither with need for more days in oxygen therapy.

Costa[20] evaluated the impact of physical therapy assistance on morbidity of NB with low birth weight and verified that 12 hours of daily care reduced inspiratory pressure and fractions of inspired oxygen without differences between the duration of ventilation, oxygen therapy and hospitalization.

This study did not show alteration in the frequency of BPD and atelectasis, which could be expected, since there was a longer time in ventilation in the POSTP group. Costa[20] found a similar result, suggesting more than once that the presence of the physical therapist may have brought benefits to NB. On the other hand, Vasconcelos, Almeida e Bezerra[3] assessed the impact and benefits of expanding the physiotherapeutic intervention from 6 to 12 daily hours and showed reduced fractions of inspired oxygen without difference in the length of hospitalization, duration of ventilatory assistance and oxygen therapy between the two studied periods.

This study bring more consistent results when compared to the mentioned articles, since the use of scores of risk stratification favors the uniformity of samples[13]. In addition to the use of the SNAP-PE II score, only NBs weighting more than 1000g were included, which is compatible with the real and daily samples of practice of the physical therapist (NBs with extreme low weight receive minimal handling and have limitations for the use of some techniques due to clinical instability and high risk of hemorrhage[1,16]), which makes this study unprecedented and extremely relevant.

Between the periods studied, the base NICU for the research did not show changes in its structure and/or technological resources, which makes the periods comparable in relation to the therapeutic possibilities offered.

The limitations of this study refer to the inclusion of only low-risk PTNB, since the number of occurrences was not enough to include the analysis of high-risk PTNB.

Given the results shown, it was verified that the presence of the physical therapist generated benefits, contributing to the maintenance of length of hospitalization and duration of oxygen therapy even in face of a profile of more immature newborns with more complications in the period after the insertion of physical therapy.

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