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ORIGINAL ARTICLE

Impact of early discharge on the newborn

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Abstract

Introduction and objectives: In Western countries, the average length of stay in the postpartum period for newborns without complications follows a decreasing trend. The aim of the present study was to evaluate the impact of early discharge on the newborn, particularly regarding the risk of hospital readmission. **Methods:** Cross-sectional study of newborns with early discharge born in a level II hospital with differentiated perinatal support, between June 2021 and May 2022. Clinical and demographic data were obtained from the analysis of the patient's medical records and phone contact. Early discharge was considered to be the interval less than or equal to 48h between birth and discharge of the newborn. **Results:** From the 508 newborns enrolled in our study, 217 (42.7%) had an early discharge and 291 (57.3%) had a standard length of stay. The mean length of stay was 2.3 days (1.8 early discharge vs 2.6 discharge after 48h). In the comparative analysis (early discharge vs. discharge after 48h) there was no statistically significant association between early discharge and hospital readmission rate (0.5% vs 1.4%, p = 0.399), emergency observation rate (13.4% vs 10%, p = 0.233) or abandonment of exclusive breastfeeding within 15-days after postpartum discharge (22.7% vs 28.4%, p = 0.180). The results were similar for the subgroup of NB discharged within 39h. Instrumented delivery, birth weight less than 2500g, prematurity and phototherapy were factors that contributed to longer length of stay. **Conclusion:** In this study, early discharge was not associated with a higher risk for the newborn. Regarding the clinical and social advantages, this approach should be considered and supported by adequate surveillance in primary health care.

Keywords: Newborn. Early discharge. Hospital readmission. Breastfeeding.

Impacto da alta precoce no recém-nascido

Resumo

Introdução e objetivos: Nos países ocidentais, a média de dias de internamento do recém-nascido (RN) no pós-parto sem complicações percorre uma tendência decrescente. O objetivo do presente estudo foi avaliar o impacto da alta precoce no RN, em particular quanto ao risco de readmissão hospitalar. **Métodos:** Estudo transversal, realizado num hospital de nível II com apoio perinatal diferenciado. Incluíram-se RN admitidos entre junho 2021 e maio 2022. Os dados foram obtidos através da análise dos processos clínicos e contacto telefónico. Considerou-se a definição consensualizada de alta precoce o internamento com intervalo inferior ou igual a 48 horas. **Resultados:** Foram incluídos 508 RN, 217 (42,7%) tiveram alta precoce e 291 (57,2%) após as 48 horas. A média de internamento foi 2,3 dias (1,8 alta precoce *vs* 2,6 alta após 48h). Na análise

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comprativa (alta precoce *vs* alta após 48h) não se verificou associação estatisticamente significativa da alta precoce com a taxa de readmissão hospitalar (0,5% *vs* 1,4%, p = 0,399), a taxa de observação em urgência (13,4% *vs* 10%, p = 0,233) ou o abandono do aleitamento materno exclusivo nos 15 dias após a alta (22,7% *vs* 28,4%, p = 0,180). Os resultados foram sobreponíveis para o subgrupo com alta antes das 39h. O parto instrumentado, peso ao nascimento inferior a 2500g, prematuridade e fototerapia foram fatores que contribuíram para maior tempo de internamento. **Conclusão:** Neste estudo, a alta precoce não se associou a maior risco para o RN. Perante a perspetiva de vantagens clínicas e sociais, esta abordagem deverá ser ponderada e suportada por uma vigilância adequada em ambulatório.

Palavras-chave: Recém-nascido. Alta precoce. Readmissão hospitalar. Aleitamento materno.

Keypoints

What is known

- In recent years, in Western countries, there has been a downward trend in the average length of stay in the postpartum period for newborns.
- Earlier discharge of mothers and their babies has potential advantages.
- The existing evidence does not allow to recommend or contraindicate early discharge.

What is added

- A lower probability of early discharge was associated with cesarean delivery; assisted vaginal delivery; birth weight < 2500g; gestational age < 37 weeks and the need for phototherapy. Thus, these factors should be considered when the newborn is discharged, as they are well-established risk factors for readmission.
- In this study, early discharge was not associated with a higher rate of readmission, higher rate of abandonment of exclusive breastfeeding or higher rate of observation in an emergency context in the 15-day period after discharge.
- The mother-newborn dyad and its competences must be considered when proposing discharge.

Introduction

Early discharge is defined, according to the American Academy of Pediatrics, as the interval less than or equal to 48 hours between birth and discharge of the newborn[1]. However, clinical practice implemented in each country is variable and early discharge can vary from 12 to 72 hours after birth. In 2018, the average length of stay was 4.9 days in Hungary, 3.9 days in France, 3.6 days in Austria, 2.3 days in Sweden and 1.4 days in United Kingdom[2].

Early discharge is associated with benefits such as the promotion of family relationships, contributing to greater involvement of the father and siblings in caring for the newborn, improvement in the quality of maternal rest and sleep, reduced exposure to nosocomial infections to the mother-newborn dyad, and reduced costs associated with hospital admissions[3,4,5].

In recent years, there has been a downward trend in the average length of stay in the postpartum period for newborns without complications in Western countries. The European average number of days of postpartum hospitalization has decreased from 5 days in 2000 to 3.2 days in 2014[5]. In countries such as Sweden, there has been a decrease in postpartum length of stay from 6 days in 1970 to 2.3 days in 2010, in Belgium a reduction from 4.9 days of hospitalization in 2000 to 3.7 days in 2014[3,6,7,8]. In the particular case of the United Kingdom, where childbirth is the leading cause of hospital admission, with about 800,000 births annually and an estimated cost to the National Health Service of £2.5 billion per year[9], the need to reduce days of postpartum hospitalization while maintaining quality of care has become imperative. Midwives provide most perinatal care, typically comprising three phases: antenatal (8-10 visits), intrapartum, and postnatal. After birth, mothers and newborns are included in the directed national healthcare program, first in the hospital and then on an outpatient basis (at home or clinic), for a minimum period of 10 days, occurring between 3 to 6 visits. These aspects contribute to a further reduction of inpatient days, reduction in costs associated with hospital admission and better postnatal care[9].

Hospital readmission can be defined as admission within 30 days of discharge from the hospital. Readmissions in the first 15 days after discharge are considered early readmissions, with a higher probability of being directly related to the first hospitalization[10]. The most frequently identified conditions in newborn hospital readmission event are jaundice and weight loss (related with breastfeeding problems)[11].

Despite the above, the existing evidence does not support a recommendation in favor or against early discharge. Aspects such as adapting to breastfeeding,

clinical conditions that only manifest themselves from the second day of life and the need to teach mother to provide care for the newborn are sources of concern. These last ones can constitute disadvantages for the implementation of early discharge[5,12].

At our hospital, after birth, neonates are admitted with their mothers (rooming-in policy) if the gestational age is greater than 33 weeks, without risk factors, with an appropriate weight (usually > 1800 grams) and a stable clinical condition. This practice is achieved with safety supported by strict clinical surveillance. The outcomes are good throughout the years of practice of our NICU. The newborn-mother dyad is discharged together according to clinical stability and breastfeeding adaptation.

The present study aims to evaluate the impact of early discharge on the newborn. The intended was to assess the hospital readmission rate and its causes in the first 15 days after postpartum discharge, the need for observation in an emergency context, as well as the impact on breastfeeding and birth weight recovery.

Methods

Definitions

The following definitions were considered in the present study:

– Early discharge: interval less than or equal to 48 hours between birth and discharge of the newborn[1].

– Very early discharge: interval less than or equal to 39 hours between birth and discharge of the newborn.

– Standard length of stay: discharge 48 hours after the delivery.

– Length of stay: period from birth to discharge (in full hours).

– Readmission: newborns requiring hospitalization and hospital care within the first 15 days after postpartum discharge[10].

Study sample

During the study period, a total of 2,629 deliveries were performed in our hospital. Inclusion criteria included healthy newborns delivered at Hospital Garcia de Orta between June 2021 and May 2022 with a gestational age greater than 34 weeks and uncomplicated maternal postpartum period that did not interfere with increased length of stay of the newborn. Newborns requiring NICU admission, with gestational less than 34 weeks, respiratory distress, perinatal asphyxia, congenital malformations, poly-malformative syndromes or prolonged hospitalization due to maternal cause were excluded. Of the 2.629 deliveries, 255 newborns were excluded: 188 required admissions to the Intensive Care Unit (NICU), 63 were newborns with gestational age inferior to 34 weeks, three had a prolonged admission due to maternal cause and one refusal to participate in the study (Fig. 1). The selection of individuals to integrate the sample was carried out through simple randomization with Microsoft Excel® software. Five hundred and fifty newborns were included and 42 were lost for follow-up. The remaining 508 newborns were enrolled in our study. The discharge criterion was defined by the physician responsible for the newborn's discharge, according to the clinical criteria and practice of the unit.

Study location

The study was carried out in a Portuguese level two hospital with differentiated perinatal support between June 2021 and May 2022.

Study design

A cross-sectional study was carried out. The sample size was set to a 95% confidence interval with an absolute precision of 5%. Two groups were posterior established, one included the newborns with early discharge and the other included newborns with a standard length of stay (discharge 48 hours after the delivery).

Data collection

Data was obtained from the analysis of the patient's electronic medical records. Data analysis was carried out, including demographic data (sex, maternal age, parity, delivery mode, gestational age, birth weight), presence of jaundice and need for phototherapy, breastfeeding at hospital discharge and interval between birth and discharge in hours. Follow-up by telephone contact was performed on the 15th day after hospital discharge. Data was obtained from parent's report and medical records, especially hospital readmission and the causes for readmission, observation in an emergency context and its reasons, feeding after hospital discharge and birth weight recovery.

Statistical analysis

Statistical analysis was performed using the Fisher exact test and chi-square test to compare readmission

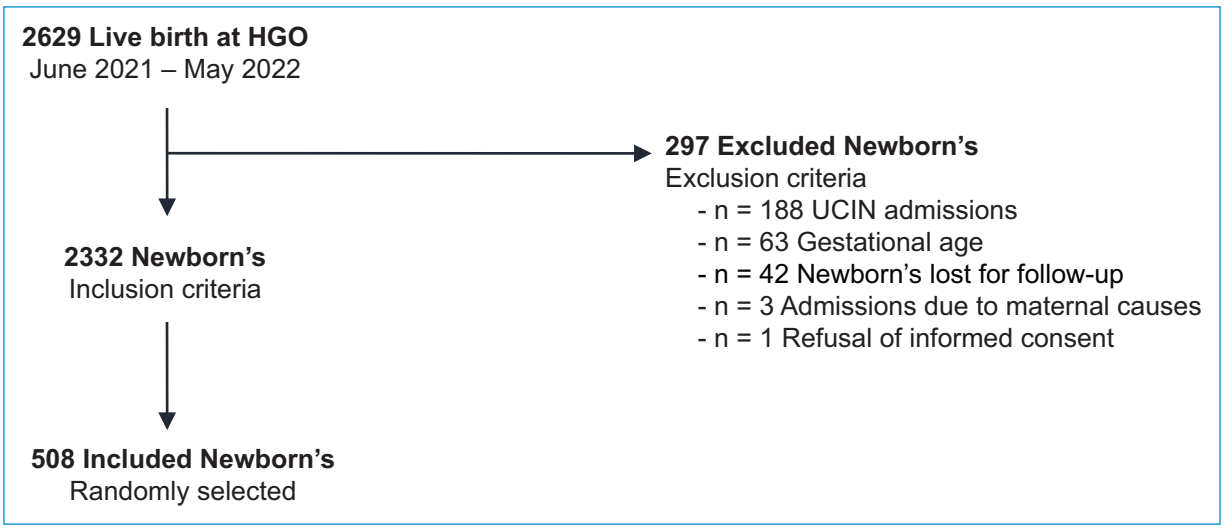

Figure 1. Study flow diagram.

rates, observation in an emergency context, breastfeeding and recovery of birth weight after discharge between groups. The chi-square test was performed to find possible associations between categorical variables. Odds ratio was calculated for the statistically significant associations and T-test for equality of means was performed to compare means of maternal age, birth weight and gestational age. The statistical work was carried out in SPSS® Statistics 28 (IBM Corp., 2021, United States of America); p values of 0.05 were considered statistically significant.

Ethical considerations

The study was approved by the hospital's Ethics Committee. Informed consent was obtained from all participants.

Results

General sample characterization (Table 1, n = 508)

The general sample included a total of 508 newborns with a median of 52 hours (30-100h) from birth to discharge. Of the 508 newborns, 255 were male and 253 were female. The median maternal age was 31 years, and 264 mothers (52%) were primiparous. The cesarean delivery rate was 30% (n = 153). The median birth weight was 3.240g, with a median gestational age of 39 weeks and five days. Twenty-five (4.9%) newborns had a gestational age of less than 37 weeks. Jaundice was found in 299 newborns (58.9%), with 38 (7.5%) requiring phototherapy. Four hundred and thirty-five (85.6%) newborns were discharged under exclusive breastfeeding.

Early discharge group characterization (Table 1, n = 217)

The early discharge group included 217 newborns (42.7%) with a median of 43 hours (30-48h) from birth to discharge. Of the 217 newborns, 112 were male and 105 were female. The median maternal age was 31 years, and 107 mothers (49.3%) were primiparous. The cesarean delivery rate was 7.8% (n = 17). The median birth weight was 3.295g, with a median gestational age of 39 weeks and six days. Three newborns (1.4%) had a gestational age of less than 37 weeks. Jaundice was found in 123 newborns (56.7%), with two (0.9%) requiring phototherapy. At hospital discharge, 185 (85.3%) newborns were exclusively breastfed.

Standard length of stay group characterization (Table 1, n = 291)

The standard length of stay group included 291 newborns (57.3%) with a median of 60 hours (48-100h) from birth to discharge. Of the 291 newborns, 143 were male and 148 were female. The median maternal age was 31 years, and 157 mothers (54%) were primiparous. The cesarean delivery rate was 46.7% (n = 136). The median birth weight was 3.185g, with a median gestational age of 39 weeks and four days. Twenty-two

Table 1. Neonatal data - demographic characterization of the general sample, early discharge group and standard length of stay group and statistical analyses

Demographic characterization	General sample (n = 508)	Early discharge group (n = 217)	Standard length of stay group (n = 291)	Statistic significancy	Odds ratio
Gender Female, n (%) Male, n (%)	 253 (49.8) 255 (50.2)	 105 (48.4) 112 (51.6)	 148 (50.9) 143 (49.1)	p = 0.581*	N/C
Mode of delivery Normal vaginal, n (%) Caesarean section, n (%) Assisted vaginal, n (%)	 286 (56.3) 153 (30.1) 69 (13.6)	 172 (79.3) 17 (7.8) 28 (12.9)	 114 (39.2) 136 (46.7) 41 (14.1)	 Reference p < 0.001* p < 0.005*	 Reference 12.07 (95%, IC 6.92 to 21.07) 2.21 (95%, IC 1.29 to 3.78)
Media/median GA (min-max)	39W+3D/39W+5D (35W+3D-41W+6D)	39W+6D/39W+6D (35W+6D-41W+6D)	39W+2D/39W+4D (35W+3D-41W+5D)	p < 0.001‡	N/C
Gestational age Term, n (%) Late preterm, n (%) Term > 40S, n (%)	 264 (52) 25 (4.9) 219 (43.1)	 109 (50.2) 3 (1.4) 105 (48.4)	 155 (53.3) 22 (7.6) 114 (39.2)	 Reference p < 0.005* p = 0.143*	 Reference 5.16 (95%, IC 1.51 to 17.66) N/C
Media/median birth weight (g) (min-max)	3244/3240 (1900-4679)	3327/3295 (2338-4679)	3183/3185 (1900-4640)	p < 0.001‡	N/C
Birth weight 2500-4000g, n (%) < 2500g, n (%) > 4000g, n (%)	 448 (88.2) 30 (5.9) 30 (5.9)	 196 (90.3) 5 (2.3) 16 (7.4)	 252 (86.6) 25 (8.6) 14 (4.8)	 Reference p < 0.005* p = 0.306*	 Reference 3.89 (95%, IC 1.46 to 10.34) N/C
BW/GA AGA, n (%) SGA, n (%) LGA, n (%)	 426 (83.9) 64 (12.6) 18 (3.5)	 185 (85.3) 22 (10.1) 10 (4.6)	 241 (82.8) 42 (14.4) 8 (2.7)	 Reference p = 0.172* p = 0.310*	N/C
Jaundice Yes, n (%) No, n (%)	 299 (58.9) 209 (41.1)	 123 (56.7) 94 (43.3)	 176 (60.5) 115 (39.5)	 p = 0.389*	N/C
Phototherapy Yes, n (%) No, n (%)	 38 (7.5) 470 (92.5)	 2 (0.9) 215 (99.1)	 36 (12.4) 255 (87.6)	p < 0.001†	15,18 (95%, IC 3.61 to 63.76)
Feeding at hospital discharge Breast, n (%) Formula, n (%) Mixed, n (%)	 435 (85.6) 15 (3.0) 58 (11.4)	 185 (85.3) 10 (4.6) 22 (10.1)	 250 (85.9) 5 (1.7) 36 (12.4)	p = 0.131*	N/C
Media/median interval between birth and discharge, hours (min-max)	54/52 (30-100)	42/43 (30-48)	63/60 (49-100)	N/A	N/C

Table 2. Maternal data - demographic characterization of the general sample, early discharge group and standard length of stay group and statistical analyses

Demographic characterization	General sample (n = 508)	Early discharge group (n = 217)	Standard length of stay group (n = 291)	Statistic significance	Odds ratio
Media/median maternal age, years (min-max)	31.4/31 (16-45)	31.3/31 (16-45)	31.6/31 (18-45)	p = 0.575‡	N/C
Maternal age (years)				p = 0.425*	N/C
< 20, n (%)	10 (2)	3 (1.4)	7 (2.4)		
20-24, n (%)	56 (11)	23 (10.6)	33 (11.3)		
25-29, n (%)	125 (24.6)	54 (24.9)	71 (24.4)		
30-34, n (%)	151 (29.7)	73 (33.6)	78 (26.8)		
> 35, n (%)	166 (32.7)	64 (29.5)	102 (35.1)		
Parity				p = 0.300*	N/C
Primiparous, n (%)	264 (52)	107 (49.3)	157 (54.0)		
Multiparous, n (%)	244 (48)	110 (50.7)	134 (46.0)		

Min: minimum; max: maximum; N/A: not applicable; N/C: not calculated.
*Chi-square test.
†Fisher exact test.
‡T-test for equality of means.

(7.6%) newborns had a gestational age of less than 37 weeks. Jaundice was found in 176 newborns (60.5%), with 36 (12.4%) requiring phototherapy. At hospital discharge, 250 (85.9%) newborns were exclusively breastfed.

Characterization of the readmissions (Table 2, n = 5)

A total of five newborns (1%) were readmitted within 15 days after discharge, one from the early discharge group and four from the standard length of stay group.

In the early discharge group, the newborn was readmitted for jaundice requiring phototherapy. In the control group, the reasons for readmission were the infectious cause (n = 2), weight loss (n = 1) and feeding difficulties in the context of laryngotracheomalacia (n = 1).

Characterization of the observation in an emergency context (Table 2, n = 58)

A total of 58 newborns (11.4%) were observed in an emergency context within 15 days after discharge.

In the early discharge group, 29 (13.4%) newborns were observed in an emergency context, the reasons for observation being nasal obstruction (n = 6), neonatal conjunctivitis (n = 5), inflammatory signs of the umbilical cord (n = 4), irritability (n = 4), jaundice (n = 3), colic (n = 2), constipation (n = 2) and general caregiver concerns (n = 3).

In the standard length of stay group, 29 (10%) newborns were observed in an emergency context, the main reasons for observation being nasal obstruction (n = 6), colic (n = 4), inflammatory signs of the umbilical cord (n = 3), irritability (n = 3), jaundice (n = 2), breast swelling (n = 2), feeding difficulties (n = 2), diaper dermatitis (n = 2), fever (n = 2), decreased urine output (n = 2) and general caregiver concerns (n = 1).

Characterization of the type of feeding after discharge and birth weight recovery (Table 2)

Fifteen days after discharge, 343 newborns (67.5%) were on exclusive breastfeeding. In the early discharge group, 149 newborns (68.7%) were exclusively breastfed and 48 (22.1%) were breastfed supplemented with infant formula. In the standard length of stay group, 194 newborns (66.7%) were exclusively breastfed and 79 (27.1%) were breastfed supplemented with infant formula.

Of the newborns who were exclusively breastfed at discharge, 113 newborns (26%) abandoned exclusive breastfeeding within 15-days after discharge, 42 (22.7%) in the early discharge group and 71 (28.4%) in the control group.

Fifteen days after discharge, 380 (77.6%) newborns regained their birth weight, 168 (80.4%) from the early discharge group and 212 (75.4%) from the control group.

Statistical analysis (Table 1, 2, 3 and 4)

A lower probability of early discharge was associated with: cesarean delivery (7.8% vs 46.3%, p value < 0.001) with an odds ratio of 12.07 (95%, IC 6.92 to 21.07); assisted vaginal delivery (12.9% vs 14.1%, p value < 0.005)

Table 3. Comparison of readmission rate, observation in an emergency context, feeding after discharge and recovery of birth weight between early discharge group and standard length of stay group

	General sample (n = 508)	Early discharge group (n = 217)	Standard length of stay group (n = 291)	Statistic significancy
Re-admission				p = 0.399*
Yes, n (%)	5 (1)	1 (0.5)	4 (1.4)	
No, n (%)	503 (99)	216 (99.5)	287 (98.6)	
Observation in an emergency context				p = 0.233†
Yes, n (%)	58 (11.4)	29 (13.4)	29 (10)	
No, n (%)	450 (88.6)	188 (86.6)	262 (90)	
Feeding after discharge				p = 0.240†
Breast, n (%)	343 (67.5)	149 (68.7)	194 (66.7)	
Formula, n (%)	38 (7.5)	20 (9.2)	18 (6.2)	
Mixed, n (%)	127 (25)	48 (22.1)	79 (27.1)	
Abandoned exclusively breastfeeding	(n = 435)	(n = 185)	(n = 250)	p = 0.180†
Yes, n (%)	113 (26)	42 (22.7)	71 (28.4)	
No, n (%)	322 (74)	143 (77.3)	179 (71.6)	
Recover birth weight	(n = 490)	(n = 209)	(n = 281)	p = 0.195†
Yes, n (%)	380 (77.6)	168 (80.4)	212 (75.4)	
No, n (%)	110 (22.4)	41 (19.6)	69 (24.6)	

*Fisher exact test.
†Chi-square test.

Table 4. Comparison of readmission rate, observation in an emergency context, feeding after discharge and recovery of birth weight between very early discharge group and standard length of stay group

	General sample (n = 508)	Very early discharge group (n = 43)	Standard length of stay group (n = 291)	Statistic significancy
Re-admission				p = 0.575*
Yes, n (%)	5 (1)	0 (0.0)	4 (1.4)	
No, n (%)	503 (99)	43 (100)	287 (98.6)	
Observation in an emergency context				p = 0.452*
Yes, n (%)	58 (11.4)	5 (11.6)	29 (10)	
No, n (%)	450 (88.6)	38 (88.4)	262 (90)	
Feeding after discharge				p = 0.415†
Breast, n (%)	343 (67.5)	33 (76.7)	194 (66.7)	
Formula, n (%)	38 (7.5)	2 (4.7)	18 (6.2)	
Mixed, n (%)	127 (25)	8 (18.6)	79 (27.1)	
Recover birth weight	(n = 490)	(n = 42)	(n = 281)	p = 0.916†
Yes, n (%)	380 (77.6)	32 (76.2)	212 (75.4)	
No, n (%)	110 (22.4)	10 (23.8)	69 (24.6)	

*Fisher exact test.
†Chi-square test.

with an odds ratio of 2.21 (95%, IC 1.29 to 3.78); birth weight < 2500g (2.3% vs 8.7%, p value < 0.005) with an odds ratio of 3.89 (95%, IC 1.46 to 10.34); gestational age < 37 weeks (1.4% vs 7.6%, p value < 0.005) with an odds ratio of 5.16 (95%, IC 1.51 to 17.66) and the need for phototherapy (0.9% vs 12.4% 95%, p value < 0.001) with an odds ratio of 15.18 (95%, IC 3.61 to 63.76).

Delay in discharge was not associated with: maternal age, with a median maternal age of 31 years in both groups; primiparity (49.3% vs 54%, p value = 0.300); presence of jaundice (56.7% vs 60.5%, p value = 0.389) and exclusive breastfeeding (85.3% vs 85.9%, p value = 0.131).

Early discharge was not associated with a higher readmission rate (0.5% vs 1.4%, p value = 0.399). Analyzing the subgroup of newborns with very early discharge (30 to 39 hours), there was also no association with a higher readmission rate (0% vs 1.4%, p value = 0.575). Excluding the variable cesarean

Table 5. Comparison of readmission rate, observation in an emergency context, feeding after discharge and recovery of birth weight between early discharge group and standard length of stay group excluding caesarean section delivery

Excluding caesarean section	General sample (n = 355)	Early discharge group (n = 200)	Standard length of stay group (n = 155)	Statistic significancy
Re-admission				p = 0.889*
Yes, n (%)	4 (1.1)	1 (0.5)	3 (1.9)	
No, n (%)	351 (98.9)	199 (99.5)	152 (98.1)	
Observation in an emergency context				p = 0.631†
Yes, n (%)	47 (13.2)	28 (14)	19 (12.3)	
No, n (%)	308 (86.8)	172 (86)	136 (87.7)	
Feeding after discharge				p = 0.276†
Breast, n (%)	243 (68.5)	136 (68)	107 (69)	
Formula, n (%)	27 (7.6)	19 (9.5)	8 (5.2)	
Mixed, n (%)	85 (23.9)	45 (22.5)	40 (25.8)	
Recover birth weight	(n = 343)	(n = 193)	(n = 150)	p = 0.095†
Yes, n (%)	264 (74.4)	155 (80.3)	109 (72.7)	
No, n (%)	79 (22.3)	38 (19.7)	41 (27.3)	

*Fisher exact test.
†Chi square test.

delivery (Table 5), as a possible confounding factor, there was also no association with a higher readmission rate (0.5% vs 1.9%, p value = 0.889).

Early discharge was not associated with a higher rate of observation in an emergency context (13.4% vs 10%, p value = 0.233) within 15-days after discharge. Analyzing the subgroup with very early discharge and excluding cesarean delivery (Table 5) there was also was no association with a higher rate of emergency observation (respectively 11.6% vs 10%, p value = 0.452 and 14% vs 12.3%, p value = 0.631).

Early discharge was not associated with a lower rate of exclusive breastfeeding (68.7% vs 66.7%, p value = 0.240) in the 15-days after hospital discharge. Analyzing the subgroup with very early discharge and excluding cesarean delivery (Table 5) there was also was no association with lower rate of exclusive breastfeeding (respectively 76.7% vs 66.7%, p value = 0.415 and 68% vs 69%, p value = 0.276). Early discharge was not associated with a higher abandonment of exclusively breastfeeding compared with discharge after 48 hours (respectively 22.7% vs 28.4%, p value = 0.180).

Early discharge was not associated with lower birth weight recovery (80.4% vs 75.4%, p value = 0.195). Analyzing the subgroup with very early discharge and excluding cesarean delivery there was also no association with lower birth weight recovery (respectively 76.2% vs 75.4%, p value = 0.916 and 80.3% vs 72.7%, p value = 0.095).

Discussion

Although early discharge is associated with benefits, the existing evidence does not allow to recommend or contraindicate this practice. Aspects such as breastfeeding adaptation, clinical conditions that only manifest themselves from the second day of life (jaundice) and mother education on the adequate newborn care represent sources of major concerns with early discharge[3-5,12]. To the best of our knowledge, this is the first Portuguese study on the impact of early discharge on newborns.

In recent years, there has been a downward trend in the average length of stay in the study, the mean length of stay for all deliveries was 2.3 days (54 hours), which is lower than the average of 2.9 days of Organization for Economic Cooperation and Development (OECD) countries and similar to the data report by Sweden and Denmark (2.3 days)[2]. In the early discharge group, the mean length of stay was 1.8 days (30 to 48 hours) and in the standard length of stay group it was 2.6 (49 to 100 hours).

Our findings are similar to the study by *Oddie* et al.[13] and show that infants were less likely to be discharged early if they were born to cesarean delivery or assisted vaginal delivery, if birth weight was lower than 2500g, gestational age inferior to 37 weeks or if they needed phototherapy. In contrast with *Oddie* et al.,[13] younger mothers, primiparous and exclusive breastfeeding weren't associated with a delay in discharge in our sample.

The global readmission rate in this study was 1% similar to the results of *Young* et al. (1.12%)[11] and *Escobar* et al. (1.0% to 3.7%)[14]. It was also similar to the readmission rate of newborns, within the first 15-days after postpartum discharge, from our hospital, in the same period (1.4%). These results contrast with results from *Farhat* et al. where the mean length of stay was 1.6 days and readmission rates were 7.9%[15]. The early discharge group was found to have a readmission rate of 0.5% and the standard length of stay group had a 1.4% readmission rate. Thus, in this study, early discharge was not associated with a higher readmission rate in the 15-days after postpartum discharge. Analyzing the subgroup of newborns with very early discharge (between 30 and 39 hours), these were also not associated with a higher readmission rate. When cesarean deliveries are excluded, as a possible confounding factor, the results remain the same. These results are similar to the report by *Benahmed* et al.[3] in their systematic literature review and contrast with the results presented by *Jones* et al.[7] in their meta-analysis, where infant readmission to hospital within 28-days after birth revealed that infants were significantly more likely to be readmitted to hospital if they were discharged less than 48 hours after birth. The *Farhat* et al.[15] study showed that early discharge was associated with an increased likelihood of readmission during the first two weeks of life as compared with later discharge. The present study identified as the cause of readmission jaundice requiring phototherapy in the early discharge group and infectious cause, weight loss and feeding difficulties in the context of laryngotracheomalacia in the standard length of stay group. The findings described above are comparable to the main causes of readmissions described by *Young* et al.[11] (feeding problems, jaundice, respiratory distress and infection). Despite what has been described, the reduced number of readmissions does not allow solid conclusions to be drawn on this specific issue.

Concerning newborns observed in an emergency context within 15-days after discharge, neither early discharge nor very early discharge were associated with a statistically significant increase in the rate of observations when compared to the standard length of stay group. These results are in line with those described by *Jones* et al.,[7] where early postnatal discharge, compared with later discharge, probably makes little to no difference in the number of infants having at least one unscheduled medical consultation or contact with health professionals within the first four weeks after birth.

A positive aspect that this study highlights from our practice is the high percentage of newborns discharged from the hospital under exclusive breastfeeding (85%), superior to the described by *McDonald* et al. (61.6%)[16], similar to the described by *Castillejos* et al. (80.2%)[17]. This practice is a strong quality indicator following the Baby Friendly Health Initiative benchmark (75%)[18]. This study showed no differences between the early discharge group and the standard length of stay group (68.7% vs 66.7%) in the exclusive breastfeeding rate within 15-days after postpartum discharge. Even when analyzing the group with very early discharges (76.7%), the findings are similar. These results are in agreement with those described by *Jones* et al.[7] and *Benahmed* et al.,[3] both showing that early discharge mothers were equally likely to breastfeed their neonates as those with standard length of stay. Early discharge also did not negatively impact the birth weight recovery (80.4% vs 75.4%). These results are in agreement with that described by *Benahmed* et al.,[3] where no significant difference was found between early discharged newborns and infants with a standard length of stay regarding weight gain in the first 10 to 20 days after postpartum discharge.

Approximately 22% of newborns abandoned exclusive breastfeeding within 15-days after discharge with no statistically significant difference between early discharge and the standard length of stay groups (22.7% in the early discharge group and 28.4% in the standard length of stay group). This is an important finding as the abandonment of exclusive breastfeeding is one of the major concerns related to early discharge. According to *Vila-Candel* et al.,[19] approximately half of the mothers who offer breastfeeding initially do not fulfill their expectations for one month. *Vila-Candel* et al.[19] and *Oliver-Roig* et al.[20] report that the most critical time point for abandonment is the first 12 days of the infant's life.

In this study, early discharge was not associated with a higher readmission rate, a lower rate of adherence to exclusive breastfeeding or a higher rate of observation in an emergency context in the 15-day period after discharge, when compared to standard length of stay. On the other hand, a lower probability of early discharge was associated with cesarean delivery; assisted vaginal delivery; birth weight < 2500g; gestational age < 37 weeks and the need for phototherapy. Although there was no statistically significant difference when analyzing the subgroup of newborns delivered by cesarean section, the remaining factors should be considered when the newborn is discharged, as they are well-established risk factors for readmission.

Early discharge is the gold standard in several European countries, supported by a well-established surveillance network. The frequent evaluation of the newborn in the first weeks of life requires the recruitment of important human and financial resources in the structure of the national health system. The reduction of costs related to shorter hospital length of stay should be taken into account when allocating these resources to the care of the mother and newborn. The evaluation of the newborn, close to its family environment, should always be privileged.

This is a single institution study on a level II hospital, and, therefore, the results may not be generalizable to the Portuguese pediatric population. Thus, larger, multi-center studies on this topic are important for a better understanding of the impact of early discharges, in order to allow the creation of robust recommendations on this subject.

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Conflicts of interest

None.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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References

1. Committee on Fetus and Newborn. American Academy of Pediatrics. Hospital stay for healthy term newborns. Pediatrics. 2004;113:1434-6.
2. OECD (2019), "Average length of stay in hospitals", in Health at a Glance 2019: OECD Indicators, OECD Publishing, Paris.
3. Benahmed N, Miguel L, Devos C, Fairon N, Christiaens. Vaginal delivery: how does early hospital discharge affect mother and child outcomes? A systematic literature review. BMC Pregnancy and Childbirth. 2017;17:289.
4. Lemyre B, Jefferies A, O'Flaherty P. Facilitating discharge from hospital of the healthy term infant: Position Statement of Canadian Paediatric Society. Paediatrics & Child Health. 2018; 515-22.
5. Goyal N, Zubizarreta J, Small D, Lorch S. Length of Stay and Readmission Among Late Preterm Infants: An Instrumental Variable Approach. Hosp Pediatr. 2013; 3(1):7-15.
6. Lefèvre M, Heede K, Camberlin C, Bouckaert N, Beguin C, Devos C, et al. Impact of shortened length of stay for delivery on the required bed capacity in maternity services: results from forecast analysis on administrative data. BMC Health Services Research. 2019;19:637.
7. Jones E, Stewart F, Taylor B, MacArthur C, Bradshaw S, Hope L, et al. Early Postnatal Discharge for Infants: A Meta-analysis. Pediatrics. 2020;146(3):e20193365.
8. Chen I, Choudhry A, Wen S. Minimizing length of hospital stay for women's reproductive care. CMAJ. 2018;190(28): E846-847.
9. Bowers J, Cheyne H. Reducing the length of postnatal hospital stay: implications for cost and quality of care. BMC Health Services Research. 2016;16:16.
10. Hain PD, Gay JC, Berutti TW, Whitney GM, Wang W, Saville BR. Preventability of early readmissions at a children's hospital. Pediatrics. 2013;131(1).
11. Young P, Korgenski K, Buchi K. Early Readmissions of Newborns in a Large Health Care System. Pediatrcis. 2013;131:e1538-44.
12. Jones E, Stewart F, Taylor B, Davis PG, Brown SJ. Early postnatal discharge from hospital for healthy mothers and term infants. Cochrane Database of Systematic Reviews 2021, Issue 6. Art. No.: CD002958.
13. Oddie S, Hammal D, Richmond S, Parker L. Early discharge and readmission to hospital in the first month of life in the Northern Region of the UK during 1998: a case cohort study. Arch Dis Child. 2005; 90:119–24.
14. Escobar GJ, Greene JD, Hulac P, Kincannon E, Bischoff K, Gardner MN, et al. Re-hospitalization after birth hospitalization: patterns among infants of all gestations. Arch Dis Child. 2005;90(2):125–31.
15. Farhat R, Rajad M. Length of postnatal hospital stay in healthy newborns and re-hospitalization following early discharge. N Am J Med Sci. 2011;3(3):146-51.
16. McDonald S, Pullenayegum E, Chapman B, Vera C, Giglia C, Foster G. Prevalence and predictors of exclusive breastfeeding at hospital discharge. Obstet Gynecol. 2012;119(6):1171-9.
17. Castillejos A, Salgado J, Almargo J, Martínez A. Development and validation of a predictive model of exclusive breastfeeding at hospital discharge: Retrospective cohort study. International Journal of Nursing Studies. Volume 117, May 2021, 103898.
18. Vasilevski V, Arnold T, Halliday K, Hughes J, Dwyer N, Sweet L. Breastfeeding practices in an Australian tertiary care hospital: A retrospective study. Sexual & Reproductive Healthcare. Volume 30, December 2021, 100671.
19. Vila-Candel R., Soriano-Vidal F.J., Murillo-Llorente M., Pérez-Bermejo M., Castro-Sánchez E. Mantenimiento de la lactancia materna exclusiva a los 3 meses posparto: Experiencia en un departamento de salud de la Comunidad Valenciana. Aten. Prim. 2019;51:91–8.
20. Oliver-Roig A., Chulvi-Alabort V., Lopez-Valero F., Lozano-Dura M.S., Seva-Soler C., Perez-Hoyos S. Critical moments for weaning in a 6-month follow-up study. Enferm. Clin. 2008;18:317–20.