

Effect of implementation of an early hospital discharge policy on the readmission rates of neonates born by uncomplicated vaginal delivery: matched cohort study with historical controls

Gemma P Maranian,¹ Feliciano A Yamas^{1,2}

¹Department of Pediatrics, Davao Regional Hospital, Apokon, Tagum City, Philippines

²Medical Mission Group Hospital and Health Services Cooperative of Tagum, Visayan Village, Tagum City, Philippines

Correspondence

Gemma P Maranian
gmaranian@yahoo.com

Received

29 April 2015

Accepted

11 June 2015

Cite as

Maranian GP, Yamas FA. Effect of implementation of an early hospital discharge policy on the readmission rates of neonates born by uncomplicated vaginal delivery: matched cohort study with historical controls. *SPMC J Health Care Serv.* 2015;1(1):20-24.

Copyright

© 2015 GP Maranian, et al.

ABSTRACT

Background. In August 2011, Davao Regional Hospital started to implement an early hospital discharge policy (within 48 hours after delivery) for term neonates born by uncomplicated vaginal delivery, with normal physical findings, good suck, urine output, and stool output.

Objective. To compare the readmission rates before and after the implementation of an early hospital discharge policy among neonates.

Design. Matched cohort study with historical controls.

Setting. Davao Regional Hospital in Tagum City, Philippines.

Participants. 1,960 term neonates born by uncomplicated vaginal delivery.

Main outcome measures. Readmission rates before and after implementation of an early hospital discharge policy, odds ratios (95% CI) of readmission for selected clinical characteristics of neonates.

Main results. There were 980 neonates prior to policy implementation and another 980 neonates after policy implementation who were included in the analysis. Neonates in the pre-implementation and post-implementation groups were comparable in terms of gestational age (39 ± 1 weeks and 39 ± 1 weeks, respectively; $p=0.215$) and sex distribution (male to female ratios 510:470 and 517:463, respectively; $p=0.752$). There were 18 (1.8%) readmissions in the pre-implementation group and 49 (5%) in the post-implementation group ($p<0.001$). A hospital stay of less than 24 hours significantly increased the odds of readmission (OR=1.8; 95% CI 1.1 to 3.1).

Conclusion. The readmission rate of neonates was higher after the implementation of an early (less than 48 hours after delivery) hospital discharge policy. Discharging neonates before 24 hours of life increased the odds ratio of readmission.

Keywords. neonatal care, healthy term neonates, length of hospital stay

INTRODUCTION

Over the years, the duration of hospital stay of neonates born by uncomplicated deliveries has been observed to have a decreasing trend.¹ Early newborn discharge is defined as discharge from birthing facilities within less than 48 hours after birth.² The practice of early newborn discharge of uncomplicated vaginal deliveries has been adapted in hospitals in the Philippines,³ as well as in other countries.^{1,4}

The advantage of early discharge for well newborns has not been well established.¹ In some studies, readmission rates have been reported to increase among neonates discharged early.⁵⁻⁹ In other studies, early discharge was not found to significantly affect readmission rates of newborns.^{3,10} The inconsistent results of these studies may be related to the different definitions of early discharge across the studies, which varied from less than 24 hours after delivery¹¹ to as long as 48 hours after delivery.¹²

The American Academy of Pediatrics (AAP) developed clinical practice guidelines that emphasize individualization of decisions to discharge newborns^{2,13} in order to avoid complications.⁸ These guidelines, however, cannot be totally adopted in local hospitals because of lack of resources needed for their implementation, such as follow-up

IN ESSENCE

Early discharge of well newborns from birthing facilities can help address bed capacity problems.

In this study, an early (less than 48 hours after delivery) hospital discharge policy among neonates increased the readmission rate within the neonatal period.

Adequate observation time for the possible development of neonatal morbidities should be considered in making a policy on the timing of discharging neonates from birthing facilities.



facilities.²

In August 2011, Davao Regional Hospital (DRH) implemented an early (within 48 hours after delivery) hospital discharge policy among term neonates born by uncomplicated vaginal delivery, with normal physical findings, and with good suck, urine output and stool output. The policy implementation was intended to address the observed long stay of neonates, which resulted in patient congestion in the maternal wards. This study was done in order to compare the readmission rates among neonates before and after the implementation of the early hospital discharge policy.

METHODS

Study design and setting

In September 2013, we reviewed medical records covering August 2010 to August 2012 in order to carry out this retrospective cohort study with historical controls. Data came from medical record entries of doctors from the Department of Pediatrics at DRH, a tertiary government health facility in Tagum City, Davao del Norte in Southern Philippines. The Department of Pediatrics assesses 4,000 to 5,000 neonates delivered within the hospital's Obstetrics Department annually.

Participants

We identified neonates who fulfilled the following criteria: term; born by uncomplicated vaginal delivery; singleton; with gestational age of 37 to 41 weeks and 6 days; with APGAR scores at 1 minute and 5 minutes of at least 8; with appropriate weight-for-age (within 2,200 grams to 3,800 grams); and with normal physical findings. Patients were ineligible if they were discharged from the hospital against medical advice. A total of 7,154 neonates were eligible for inclusion. In order to estimate the appropriate sample size for this study, we took the readmission rate of a 3-month sample during the first year of the study (4.2%) and assumed it to be the readmission rate prior to the implementation of the early discharge policy. We wanted for the study to detect a 3% difference in readmission rates as statistically significant. In a test for comparison of two readmission rates with a two-sided significance of <5%, a total sample size of 1,960 neonates would have 80% power to reject the null hypothesis if the alternative

holds. A random sample of 980 neonates from among those born before the implementation of the early hospital discharge policy in August 2011 was selected from the eligible patients to comprise the historical pre-implementation group. A second random sample of 980 neonates from among those born after the policy implementation comprised the post-implementation group.

Data collection

From the medical records of all the neonates included, we collected the following: gestational age (by Ballard score) in weeks, sex, provincial addresses, birthweight, and APGAR scores at 1 minute and 5 minutes. We also measured the length stay as the number of hours from birth up to the time that a discharge order was written in the patient's chart.

The primary outcomes that we measured in this study were the readmission rates before and after implementation of an early hospital discharge policy and the odds ratios (95% CI) of readmission for selected clinical characteristics of neonates. We determined the readmission status by checking the patients' medical records for re-entry into the institution within the first 28 days of life.

The secondary outcomes were: causes of readmission and dispositions of patients upon discharge from readmission. We categorized causes of readmission as 'infectious,' or 'non-infectious.' We classified dispositions of patients on discharge from readmission as 'discharged by attending physician,' or 'discharged against medical advice.'

Statistical analysis

We used descriptive statistics to summarize the data. We compared the baseline characteristics, admission rates, and causes of readmission of neonates between the pre-implementation and post-implementation groups. Continuous variables were compared using t-test, while categorical variables were compared using chi-square. Two-sided p-values of <0.05 were considered statistically significant. We used logistic regression to calculate the odds ratios (95% CI) of readmission for the following pre-specified, dichotomous demographic and clinical characteristics of the neonates: gestational age <40 weeks, male sex, birthweight <3,000

Table 1 Baseline demographic and clinical characteristics of 1960 neonates

Characteristics	Pre-implementation n=980	Post-implementation n=980	p-value
Mean gestational age \pm SD, weeks	39.2 \pm 1.0	39.2 \pm 1.2	0.490
Sex, frequency (%)			0.752
Male	510 (52)	517 (52.8)	
Female	470 (51)	463 (47.2)	
Provincial address, frequency (%)			0.188
Davao del Norte	662 (67.6)	695 (70.9)	
Davao del Sur	3 (0.3)	3 (0.3)	
Davao Oriental	6 (0.6)	14 (1.4)	
Compostela Valley	291 (29.7)	250 (25.5)	
Agusan del Sur	17 (1.7)	16 (1.6)	
Others	1 (0.1)	2 (0.2)	
Mean birthweight \pm SD, grams	3,010 \pm 345	3,042 \pm 347	0.040*
Mean APGAR score at 1 minute	8	8	1.000
Mean APGAR score at 5 minutes	9	9	1.000
Mean length of hospital stay \pm SD, hours	47 \pm 11	27 \pm 8	<0.001*

*Statistically significant.

grams, hospital stay <24 hours, and residing within Davao del Norte (provincial address of the hospital study site). Statistical analyses were done using Epi Info version 7.1.0.6.

RESULTS

Neonates in the pre-implementation group were comparable with those in the post-implementation group in terms of gestational age, sex distribution, provincial address distribution, and APGAR scores (Table 1). Compared to neonates in the pre-implementation group, those in the post-implementation group had significantly higher mean birthweight by 32 grams at

Table 2 Comparison of outcome measures between readmitted patients in the pre-implementation group and post-implementation group

Characteristics	Pre-implementation n=18†	Post-implementation n=49†	p-value
Readmissions, frequency (%)	18 (1.8)‡	49 (5.0)‡	<0.001*
Mean age \pm SD on readmission, days	11.5 \pm 5.4	9.0 \pm 6.4	0.142
Causes of readmission, frequency (%)			0.751
Infectious	11 (61.1)	32 (65.3)	
Non-infectious	7 (38.9)	17 (34.7)	
Dispositions after readmission, frequency (%)			0.595
Discharged by attending physician	16 (88.9)	41 (83.7)	
Discharged against medical advice	2 (11.1)	8 (16.3)	

*Statistically significant; †unless specified otherwise; ‡n=980.

baseline ($p=0.040$). The mean length of initial hospital stay of neonates in the pre-implementation group was significantly longer compared to that of neonates in the post-implementation group (47 ± 11 hours versus 27 ± 8 hours, $p<0.001$). Implementation of the early hospital discharge policy reduced initial hospital stay by 20 hours (Table 1).

There were 18 (1.8%) readmissions within 28 days of life among the neonates in the pre-implementation group and 49 (5.0%) readmissions among those in the post-implementation group ($p<0.001$). The mean ages of readmitted neonates were similar between the two groups (11.5 ± 5.4 days old in pre-implementation group; 9.0 ± 6.4 days old in post-implementation group; $p=0.142$). Infections were the most common cause of readmission. The distributions of causes of readmission and dispositions after readmission were similar between the two groups ($p=0.751$ and $p=0.595$, respectively) (Table 2).

The odds ratios of readmission for selected neonatal characteristics are shown in Table 3. Hospital stay of less than 24 hours was significantly associated with being readmitted during the neonatal period (OR=1.8, 95% CI 1.1 to 3.1). Gestational age, sex, birthweight, and provincial address did not significantly change the odds ratios of being readmitted (Table 3).

DISCUSSION

Key results

Neonatal readmission rate after the implementation of the early (within 48 hours of delivery) hospital discharge policy was significantly higher, compared to the rate before the implementation. Odds ratio of readmission significantly increased among neonates discharged before 24 hours of life. Infectious problems were the most common causes of readmission.

Strengths and limitations

We have included a large number of neonates in our analysis, covering discharge practices the year before and the year after the early hospital discharge policy was operationalized in our institution, and we accounted for readmissions within the first 28 days of life. This study was able to demonstrate a significant increase in readmission rate subsequent to the implementation of an early hospital discharge policy to respond to

Table 3 Odds ratios (95% CI) of readmission for selected neonatal characteristics

Characteristics	OR (95% CI)
Gestational age <40 weeks	0.8 (0.5 to 1.3)
Male sex	1.1 (0.7 to 1.8)
Birthweight <3000 grams	0.7 (0.4 to 1.2)
Hospital stay <24 hours	1.8 (1.1 to 3.1)*
Residing within Davao del Norte	1.1 (0.7 to 1.9)

*Statistically significant.

patient congestion in a maternal ward.

We did not attempt to trace readmissions to other hospitals or health facilities in this study. Since we only accounted for the readmissions within the same facility where the neonates were delivered, we may have underestimated the true readmission rates among neonates in both pre-implementation and post-implementation groups. In addition, we did not factor in the influence of compliance to follow-up care after discharge, or maternal characteristics that may affect newborn readmission, such as income, maternal education, and parity, in this study. Lastly, although the sample size of this study was adequate to detect differences in rates of neonatal readmission, it was not powered to detect rare events like neonatal death.

Interpretation

Higher readmission rates among neonates discharged early have also been observed in other studies.^{5-10 14} Neonatal morbidities often manifest within the first week of life.¹⁵ Delayed discharge from the birthing facility is meant to allow detection or careful observation of the evolution of these morbidities. On the other hand, long stays in birthing facilities may expose neonates to pathogens that can cause nosocomial infections.

We set out to do this study with an assumption that, prior to the early hospital discharge policy implementation, neonates in our institution who fulfill our inclusion criteria had been admitted for, on average, more than 48 hours. We found out in this study that the mean length of hospital stay of neonates before policy implementation was a little less than two days. Policy implementation significantly reduced the mean length of stay to almost half, but concomitantly increased the readmission rate within the neonatal period.

In contrast to earlier studies, which reported that children discharged before 24

hours of life were at risk of being readmitted for jaundice,^{5 9 10} we found that infectious causes accounted for most readmissions. Our findings are consistent with another study, which reported that neonatal sepsis was the leading cause of readmission in the first month of life, followed by neonatal jaundice.¹⁶

Generalizability

Neonatal discharge planning should be made cautiously. Regular assessment and appropriate revisions of early discharge policies should be done in order to factor in the consequences that they may have on patients. Our findings support delaying discharge of neonates up to at least 47 hours in order to avoid a higher risk of readmission within the neonatal period. We believe that our findings are applicable to neonates similar to those in our study and in institutions similar to ours. In view of the limitations of the present study, future studies should attempt the identification of other variables that influence readmission following early discharge of newborns, such as maternal education, income, and parity. The association of compliance with follow-up care among newborns who have been discharged early to the risk of readmission should also be investigated.

CONCLUSION

In this cohort study, we found out that readmission rate was higher after the early hospital discharge policy was implemented among neonates, that hospital stay of less than 24 hours significantly increased the odds ratio of readmission, and that infections were the most common cause of readmission.

Acknowledgments

We thank Dr Alvin Concha for his comments on the protocol and final report for this research.

Ethics approval

This study was reviewed and approved by the Department of Health XI Cluster Ethics Review Committee (DOH XI CERC reference P13031801).

Reporting guideline used

STROBE Checklist (http://www.strobe-statement.org/fileadmin/Strobe/uploads/checklists/STROBE_checklist_v4_combined.pdf)

Article source

Submitted

Peer review

External

Funding

Supported by personal funds of the authors.

Competing interests

None declared

Access and license

This is an Open Access article licensed under the Creative Commons Attribution-NonCommercial 4.0 International License, which allows others to share and adapt the work, provided that derivative works bear appropriate citation to this original work and are not used for commercial purposes. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc/4.0/>

REFERENCES

1. Gupta P, Malhotra S, Singh DK, Dua T. Length of postnatal stay in healthy newborns and re-hospitalization following their early discharge. *Indian J Pediatr.* 2006;73(10):897-900.
2. Committee on Fetus and Newborn. Hospital stay for healthy term newborns. *Pediatrics.* 2004;113(5):1434-6.
3. Iran M. Effect of early infant discharge and readmission rate for normal delivery in VSMC: A prospective study from January 2004 to May 2004. *The Philippine Journal of Pediatrics.* 2005;54:115-117.
4. Margolis LH. A critical review of studies of newborn discharge timing. *Clin Pediatr (Phila).* 1995;34(12):626-34.
5. Danielsen B, Castles AG, Damberg CL, Gould JB. Newborn discharge timing and readmissions: California, 1992-1995. *Pediatrics.* 2000;106(1 Pt 1):31-9.
6. Liu LL, Clemens CJ, Shay DK, Davis RL, Novack AH. The safety of newborn early discharge. The Washington State experience. *JAMA.* 1997;278(4):293-8.
7. Eidelman AI. Early discharge--early trouble. *J Perinatol.* 1992;12(2):101-2.
8. Braveman P, Egerter S, Pearl M, Marchi K, Miller C. Problems associated with early discharge of newborn infants. Early discharge of newborns and mothers: a critical review of the literature. *Pediatrics.* 1995;96(4 Pt 1):716-26.
9. Grupp-Phelan J, Taylor JA, Liu LL, Davis RL. Early newborn hospital discharge and readmission for mild and severe jaundice. *Arch Pediatr Adolesc Med.* 1999;153(12):1283-8.
10. Coody D, Yetman RJ, Montgomery D, Van eys J. Early hospital discharge and the timing of newborn metabolic screening. *Clin Pediatr (Phila).* 1993;32(8):463-6.
11. Brown S, Bruinsma F, Darcy MA, Small R, Lumley J. Early discharge: no evidence of adverse outcomes in three consecutive population-based Australian surveys of recent mothers, conducted in 1989, 1994 and 2000. *Paediatr Perinat Epidemiol.* 2004;18(3):202-13.
12. Rush J, Chalmers I, Enkin M. Care of the new mother and baby. In: Chalmers I, Enkin M, Keirse MJ, editors. *Effective Care in Pregnancy and Childbirth: Pregnancy.* Oxford University Press, USA; 1989. p. 1341-4.
13. Oberer D, Auckerman L. Best practice: clinical pathways for uncomplicated births. *Best Pract Benchmarking Healthc.* 1996;1(1):43-50.
14. Maisels MJ, Kring E. Length of stay, jaundice, and hospital readmission. *Pediatrics.* 1998;101(6):995-8.
15. Bang AT, Reddy HM, Baitule SB, Deshmukh MD, Bang RA. The incidence of morbidities in a cohort of neonates in rural Gadchiroli, India: seasonal and temporal variation and a hypothesis about prevention. *J Perinatol.* 2005;25 Suppl 1:S18-28.
16. Habib HS. Impact of discharge timings of healthy newborns on the rates and etiology of neonatal hospital readmissions. *J Coll Physicians Surg Pak.* 2013;23(10):715-9.