

# The Safety of Canadian Early Discharge Guidelines

## Effects of Discharge Timing on Readmission in the First Year Post-discharge and Exclusive Breastfeeding to Four Months

Sharon Yanicki, BSN, RN<sup>1</sup>

Paul Hasselback, MD, MSc, FRCPC<sup>1</sup>

Mark Sandilands, PhD<sup>2</sup>

Chris Jensen-Ross, BN, RN<sup>1</sup>

### ABSTRACT

**Background:** Few studies have examined earlier discharge in relation to Canadian guidelines for earlier discharge and infant feeding. We addressed differences in readmission (1 year post-discharge) and exclusive breastfeeding (4 months) for newborns and mothers discharged within 48 hours compared to those with a longer hospital stay.

**Method:** A cohort of 1,357 vaginally delivered singleton normal newborns and their mothers (births between January 1, 1996 and March 31, 1997) were studied by linking five databases and a chart audit.

**Results:** Overall there were no differences in infant and maternal readmission or rates of exclusive breastfeeding.

**Conclusion:** Canadian guidelines for earlier discharge appear appropriate for vaginally delivered singleton normal newborns and their mothers with timely home visitation.

The translation of the Abstract appears at the end of the article.

1. Chinook Health Region, Lethbridge, AB

2. University of Lethbridge, Lethbridge, AB

**Correspondence and reprint requests:** Dr. Paul Hasselback, Medical Officer of Health, Chinook Health Region, 960 – 19th St. S., Lethbridge, AB T1J 1W5, Fax: 403-382-6011, E-mail: phasselback@mail.chr.ab.ca

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In 1995, the average length of stay for Alberta mothers and infants (2.6 days) was the shortest in Canada.<sup>1</sup> Few studies have examined earlier discharge in relation to Canadian practice guidelines regarding discharge timing<sup>2</sup> and infant feeding (exclusive breastfeeding to at least 4 months of life).<sup>3,4</sup> Canadian guidelines encourage postnatal counselling and community support for breastfeeding, especially in relation to shortened hospital stays.<sup>2-4</sup>

Earlier discharge (ED) has been associated with feeding problems leading to hospital readmission<sup>5</sup> and, in one Canadian study, with increased newborn morbidity.<sup>6</sup> Several studies identified no significant differences in duration of breastfeeding<sup>7,8</sup> and others reported lower rates of supplementation (first week of life) and higher breastfeeding rates (to 6 months) among ED multiparous women.<sup>9-11</sup>

Infant readmission rates of 0% to 6.5% have been reported with no difference by length of hospital stay.<sup>12</sup> Infants discharged at 24-36 hours were more likely to be readmitted in one Canadian study.<sup>6</sup> A decrease in mean length of stay (from 4.5 to 2.7 days) was associated with increased infant readmission during the first two weeks of life and increased severity of illness at readmission.<sup>13</sup> Lack of post-discharge nursing visitation was associated with higher infant readmission.<sup>14-16</sup> Maternal readmission rates at six weeks post-discharge are reported at 0.5% to 7%.<sup>15-17</sup>

### Research hypothesis

This study examined the effects of earlier discharge for newborns and mothers in relation to Canadian practice guidelines regarding discharge timing<sup>2</sup> and recommendations on infant feeding.<sup>3,4</sup> The research questions were:

1. Are there differences in hospital readmission rates for vaginally delivered, singleton, normal newborns and their mothers by length of hospital stay ( $\leq 48$  hours versus  $> 48$  hours) during the first year post-discharge?
2. Are there differences in rates of exclusive breastfeeding at 4 months of age for vaginally delivered, singleton, normal newborns and their mothers by length of hospital stay ( $\leq 48$  hours versus  $> 48$  hours)?

## METHODS

A prospective cohort study was completed utilizing clinical and administrative data from a health region in southwestern Alberta (Chinook Health Region). Five databases (from 8 hospitals and 12 community health offices) were linked with data from an audit of hospital records creating linked maternal and newborn records. Electronic data were linked deterministically (5 identification fields) and by personal health number (PHN#) (100% identified). Identifiers were then removed to create the research dataset.

Data were stratified by length of hospital stay. Infant feeding reported in this paper focus on hospital and the 4-month feeding intervals. Maternal and infant readmission to hospitals (within the region) were captured during the first year post-discharge (by linkage and matching PHN#s). Admissions to other Alberta hospitals represented <1% of newborn readmissions and were excluded.<sup>18</sup>

An expert review of International Classification of Diseases-9-Case Mix (ICD-9-CM) codes was completed to select *normal newborns* (available on request). Inter-rater reliability was assessed by an independent recode of abstracted data for infant ICD-9-CMs ( $n = 50$ ,  $K = 1.0$ ) and a survey of public health nurses' coding of feeding practices ( $n = 36$ , agreement averaged 85%). Two population-based maternal variables (number employed and mean income per census tract) were developed to evaluate socio-economic status by linking postal codes (maternal residence) in the research database to mortality and census data.<sup>19</sup> A mean score per census tract was assigned to each mother. Ethical approval was obtained for the study.

Integrated services were provided (pre-natal, hospital and post-discharge). Early discharge was guided by Canadian practice guidelines<sup>2</sup> and directed by physician order. All mothers and newborns included in the study received at least one post-discharge home visit. Detailed information on infant and maternal readmission patterns are described elsewhere.<sup>20,21</sup>

## Sample

A cohort was selected of all hospital births to singleton, vaginally delivered, normal newborns and their mothers (between January 1,

TABLE 1

## Summary of Selected Maternal and Infant Characteristics by Discharge Timing

Variable	Bivariate Data Grouping	Earlier Discharge (n = 859)	Longer Stay (n = 498)	Significance (Earlier vs Longer Stay) Crude Odds Ratio (OR) (CI = 95% Confidence Interval)
Parity	Multiparous	639	256	OR = 2.7 (CI 2.2 - 3.5)***
	Primiparous	220	241	
Maternal Age	≥ 20 years	814	452	OR = 1.8 (CI 1.2 - 2.8)**
	<20 years	45	46	
Marital Status	Couple (married & common law)	783	422	OR = 1.8 (CI 1.3 - 2.6)**
	Single (single & other)	67	65	
Maternal Case Mix Group†	(Code 611) Vaginal delivery without complications	540	279	OR = 1.5 (CI 1.1 - 2.0)**
	Other CMGs	162	124	
Infant Case Mix Group†	Normal Newborn (>2500 g)	696	385	OR = 5.6 (CI 2.2 - 14.3)***
	Other CMGs	6	18	
Maternal Risk Score	Low Risk Score	704	388	OR = 1.3 (CI 0.98 - 1.7) ††
	Moderate & High Risk Score	154	109	

\*\* Chi square  $p < 0.01$

\*\*\* Chi square  $p < 0.001$

† Case Mix Group/ICD-9-CM = International Classification of Disease-9-Case Mix Groups

†† Not Significant Chi square  $p$  value  $> 0.05$

1996 and March 31, 1997) within a regional health authority in southwestern Alberta. Infants and mothers were excluded if there was no post-discharge home visit.

*Earlier discharge* (ED) was defined as a hospital stay of  $\leq 48$  hours after the birth of the infant.<sup>2</sup>

*Normal newborns* were defined as live-born, singleton, vaginally delivered newborns (V30) with 82 specified minor complications (e.g., candidiasis of mouth) and a birthweight of  $> 2500$  grams. Exclusion criteria: Cesarean section delivery, gestation of  $< 37$  weeks, specified congenital anomalies and complications, surgery other than circumcision, adoption, in-hospital deaths and a difference of  $> 6$  hours between infant and maternal discharge.

*Feeding practices* were defined as: a) *exclusive breastfeeding* (breastfeeding with no other fluids/solids), b) *breastfeeding with supplementation* (breastfeeding with any additional liquid or solid) and c) *alternate feeding* (other than breast milk).<sup>22</sup>

*Feeding intervals* described in this paper include: *1<sup>st</sup> feed* = initial feed recorded in hospital records, *discharge feed* = feedings recorded up to and at the time of discharge and, *4 months* = feeding reported for age at contact with a public health nurse.

*Readmission (maternal and infant)* included admissions to hospitals within the region during the first year post-discharge (excluding between-facility transfers).

*Home visit* was defined as a post-discharge home visit by a public health nurse.

## Data analysis

Means, frequencies and percentages were calculated for descriptive data. Chi-square or Fisher exact probability and odds ratios were calculated. Continuous variables were evaluated through unpaired t-tests. Logistic regression was used to assess multivariate relationships. Significance was established at  $p < 0.05$ . Chi square  $p$  values are reported unless otherwise specified.

TABLE II

## Infant Feeding (Exclusively Breastfeeding vs Other Feeding) to Four Months of Age

Feeding Interval	Earlier Discharge (n = 859)		Longer Stay (n = 498)		Significance (Earlier versus Longer) Crude Odds Ratio (OR) (CI = 95% Confidence Interval)
	Breast Exclusive	Other Feeding†	Breast Exclusive	Other Feeding†	
First Feed (n = 1357)	755	104	433	65	OR = 0.92 (CI 0.65 - 1.3)†
Discharge Feed (n = 1357)	577	282	250	248	OR = 0.49 (CI 0.39 - 0.62)***
4 months (n = 980)	268	341	162	209	OR = 0.99 (CI 0.76 - 1.27)††

\*\*\* Chi square p&lt;0.001

† Other Feeding = Breastfeeding with supplementation or alternate feeding

†† Not Significant

TABLE III

## Characteristics Associated with Earlier Discharge (Hospital Stay ≤48 hours) Identified by Stepwise Forward Regression

Variables*	Probability p value	Significance (Earlier versus Longer) Estimated Odds Ratio (OR) (CI = 95% Confidence Interval)
Infant Case Mix Group (>2500 g normal versus other)	**	OR = 4.3 (CI 1.5 - 8.1)
Prenatal Education attendance (attendees versus non-attendees)	**	OR = 1.6 (CI 1.1 - 2.3)
Parity (multiparas versus primiparas)	*	OR = 1.6 (CI 1.1 - 2.3)
Induced (yes versus no)	*	OR = 1.6 (CI 1.1 - 2.2)
Maternal Case Mix Group (CMG 611 – uncomplicated delivery versus Other)	*	OR = 1.5 (CI 1.1 - 2.0)

R<sup>2</sup> for the model is 0.096

\* Chi square p&lt;0.05

\*\* Chi square p&lt;0.01

\*\*\* Chi square p&lt;0.001

Variables included within the model but not significantly related to earlier discharge included: (a) maternal age group (≤20 years versus other), (b) infant gender, (c) maternal residence (urban versus rural), (d) hospital of delivery (rural vs urban), (e) maternal risk score and (f) maternal marital status (couple versus other).

TABLE IV

## Infant and Maternal Readmission to One Year by Initial Length of Hospital Stay

Readmission Timeframe	Readmitted (n = 137)		Not Readmitted (n = 1220)		Significance (Longer vs Earlier) Crude Odds Ratio (OR) (CI 95% Confidence Intervals)
	Earlier Discharge	Longer Stay	Earlier Discharge	Longer Stay	
Infant 7-14 days	3	8	856	490	OR = 4.66 (CI 1.23 - 7.64)*
Infant First Year (12 months)	78	59	781	439	OR = 1.35 (CI 0.94 - 1.93)††
Mother First Year (12 months)	64	46	795	452	OR = 1.26 (CI 0.85 - 1.88)††

\* Chi square p&lt;0.05

†† Not Significant

## RESULTS

A cohort of 1,357 newborns and their mothers (50.8% of 2,670 births) met the selection criteria. Lack of a home visit accounted for 3.3% (n = 46) of exclusions.

Hospital data were incomplete for 4 infants. The percentage of infants lost to follow-up was 9.7% (n = 132), with 4.2% (n = 57) having moved and <1% (n = 1) having been transferred to an out-of-region hospital. One percent (n = 13) of mothers

and infants resided out of region but were included in the study if they had received one home visit. No maternal or infant deaths occurred post-discharge within the study period.

## Sample description

Sixty-three percent (n = 859) of the sample were discharged earlier (ED) (<1%, (n = 3) within 7 hours), and 36.7% (n = 498) had a longer stay (LS). The average infant was born at 39.5 weeks gestation and 50.7% were female. Slightly more mothers were from rural areas (55.2%) vs. urban areas. All mothers and infants had at least one home visit and 94.7% (n = 1285) received their first visit within 48 hours of hospital discharge.<sup>2</sup> The average mother received 1.8 home visits within the first 2 weeks post-discharge (range 1-6).

No significant differences were identified by length of hospital stay in relation to: a) infant gestation, b) maternal antenatal risk score, c) residence (rural/urban), d) home visitation within 48 hours, e) number of home visits, f) infant gender, and g) birthweight. Mothers did not differ in relation to (a) selected complicating diagnosis predicted to contribute to a longer stay (7.9%, n = 68 ED and 11.0%, n = 55 LS) or (b) population-based maternal variables (number employed and mean income per census tract).

Table I summarizes differences in selected maternal and infant characteristics. Bivariate analysis showed earlier discharge was more likely for coupled, multiparous, older (>20 years) women, with uncomplicated deliveries and newborns without complications (see Table I). A higher proportion of ED women had an induced labour (OR 1.7, 95% CI 1.3-2.2). Seventy-six percent of primiparous women attended prenatal classes and attendees were 1.7 times more likely to be discharged earlier from hospital than non-attendees (OR 1.71, 95% CI 1.11-2.71).

## Feeding rates

ED mothers were more likely to be exclusively breastfeeding at discharge (X<sup>2</sup> p<0.001). Table II summarizes rates of exclusive breastfeeding and feeding interval stratified by length of stay.

Table III summarizes the logistic regression for characteristics associated with early discharge.

## Readmission

Ten percent (n = 137) of infants were readmitted at least once in the first year post-discharge. Less than 3% of readmitted infants were transferred out-of-region (to tertiary care). There were no significant differences in infant readmission rates for the first year post-discharge, although infants discharged *later* were 4.7 times more likely to be readmitted within 7-14 days (see Table IV).

During the first year post-discharge, 8.1% (n = 110) of mothers were readmitted (7.5% (n = 64/859) ED, and 9.2% (n = 46/498) LS); 2.7% of mothers were transferred out-of-region. No significant differences were found in maternal readmission rates by length of stay. Table IV summarizes rates of infant and maternal readmission by discharge timing.

## DISCUSSION

Discharge patterns for mothers and infants show the expected consistency with guidelines,<sup>2</sup> with significant differences by Case Mix Groupings (no complications versus complications) by length of hospital stay (see Table I). Women with partners (couple versus single) were more likely to be discharged early. It is possible that these women may have had more social support at home. Population-level maternal variables did not identify differences related to socio-economic status and perhaps lacked sensitivity. Only a small portion of variance in discharge timing was identified by variables selected in this study. It is possible that physician practice and maternal preference for earlier discharge (not examined in this study) may explain some of this variance.

Women initiating exclusive breastfeeding were more likely to be discharged early. Those experiencing difficulty stayed longer. This is evident in feeding patterns at hospital discharge and regression analysis (Tables II and III). Prenatal education was also significantly associated with ED.

Home visitation was provided to all women and most received a visit within 48 hours of discharge. This service pattern differs from other areas of Alberta. In contrast, LS mothers in Alberta had 12.5% and 15.8% lower rates of home visitation (in 1995-96 and 1996-97 respectively) than ED mothers.<sup>23</sup> With home visitation,

no significant differences were noted in rates of exclusive breastfeeding at four months in this study.

## Readmission

No differences in readmission rates in the first year were identified by length of stay in this study. Infant readmission rates (3.5%) at 30 days post-discharge are similar to rates reported for Alberta infants (1996/97) (3.19-3.24%).<sup>24</sup> Two randomized trials with home visitation following earlier discharge<sup>9,10</sup> and other studies reported similar infant readmission rates.<sup>25,26</sup> This study's findings differed from several studies where an increased risk of infant readmission was associated with earlier discharge at <48 hours<sup>6,27</sup> and 48 to <72 hours.<sup>27</sup> Physician practices could explain part of these differences.

Maternal readmission in the first year did not differ significantly by discharge timing. Maternal readmission rates at 6 weeks post-discharge (2.1%) are similar to Alberta rates (1.6-3.21%)<sup>24</sup> but are higher than rates reported in several US studies (0.5-0.81%),<sup>16,17</sup> LS mothers in this study were more likely to be readmitted in the 6-week postpartum period.

## Limitations

Possible sources of bias in this study include: a) maternal choice in relation to length of hospital stay, b) under-coding of ICD-9-CM codes affecting Case Mix Groups, and c) data quality of administrative databases. Physician practice and maternal preference were not explored in this study and may be a source of bias.

## SUMMARY

Earlier discharge was associated with exclusively breastfed, prenatal-educated, coupled, induced, multiparous mothers without complications and with normal newborns. No significant differences were identified in exclusive breastfeeding (to 4 months) or in readmission rates for mothers and infants in the first year post-discharge. Canadian guidelines for earlier discharge appear appropriate for vaginally delivered singleton normal newborns and their mothers receiving services through an integrated health system with timely home visitation.

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## RÉSUMÉ

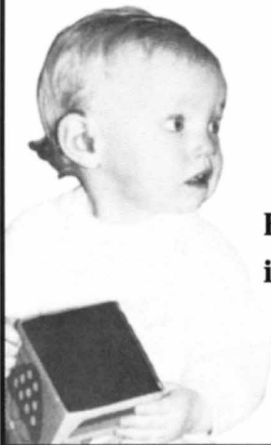
**Contexte :** Rares sont les études qui portent sur le congé précoce après l'accouchement à la lumière des recommandations canadiennes sur le congé précoce et l'allaitement des nouveau-nés. Nous avons examiné les différences entre le taux de réadmission (dans l'année suivant la sortie de l'hôpital) et le taux d'allaitement exclusivement au sein (pendant quatre mois) chez les nouveau-nés et les mères ayant obtenu leur congé de l'hôpital dans les 48 heures suivant l'accouchement et chez des sujets ayant séjourné plus longtemps à l'hôpital.

**Méthode :** Nous avons étudié une cohorte de 1 357 bébés uniques normaux nés par accouchement vaginal entre le 1er janvier 1996 et le 31 mars 1997, avec leurs mères, en vérifiant leurs dossiers médicaux et en appariant cinq bases de données.

**Résultats :** Globalement, il n'y avait pas de différence dans les taux de réadmission des mères et des nouveau-nés, ni dans les taux d'allaitement exclusivement au sein.

**Conclusion :** Les recommandations canadiennes au regard du congé précoce semblent appropriées pour les bébés uniques normaux nés par accouchement vaginal et pour les mères qui bénéficient de visites à domicile en temps opportun.

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