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2002

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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

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Chris Jensen-Ross, BN, RN1

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.

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Acknowledgements: This study was funded by the Alberta Heritage Foundation for Medical Research, Chinook Health Region, and Swift and Efficient Application of Research in Community Health (S.E.A.R.C.H.). The authors acknowledge the support and commitment of the Alberta Heritage Foundation for Medical Research; the Chinook Health Region; Dr. Linda Storoz; Dr. Don Wescott and research assistants, Isobelle Wilde and Lucia Pfeutte. Technical support was provided by Stu Fowler, computer analyst, and Laura James, health records analyst.
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.18

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.19 A mean score per census tract was determined linked maternal and newborn data from an audit of hospital records creating linked maternal and newborn databases (from 8 hospitals and 12 community health offices) were linked with mortality and census data (by linkage and matching PHN#s). One health region during the first year post-discharge (excluding between-facility transfers).

Integrated services were provided (prenatal, hospital and post-discharge). Early discharge was guided by Canadian practice guidelines2 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.20,21

Sample
A cohort was selected of all hospital births to singleton, vaginally delivered, normal newborns and their mothers (between January 1, 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 ≤48 hours after the birth of the infant.2

Normal newborns were defined as liveborn, 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).22

**METHODS**

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

<table>
<thead>
<tr>
<th>Feeding Interval</th>
<th>Earlier Discharge (n = 859)</th>
<th>Longer Stay (n = 498)</th>
<th>Variables* Probability Significance (Earlier versus Longer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Breast Exclusive</td>
<td>Other Feeding†</td>
<td>Breast Exclusive</td>
</tr>
<tr>
<td>First Feed</td>
<td>755</td>
<td>104</td>
<td>433</td>
</tr>
<tr>
<td>(n = 1357)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge</td>
<td>577</td>
<td>282</td>
<td>250</td>
</tr>
<tr>
<td>(n = 1357)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 months</td>
<td>268</td>
<td>341</td>
<td>162</td>
</tr>
<tr>
<td>(n = 980)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Chi square p<0.05
† Other Feeding = Breastfeeding with supplementation or alternate feeding
†† Not Significant

### TABLE III

<table>
<thead>
<tr>
<th>Variables*</th>
<th>Probability</th>
<th>Significance (Earlier versus Longer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge Feed (exclusive breastfeeding versus other feeding)</td>
<td>* Chi square p&lt;0.05</td>
<td>Estimated Odds Ratio (OR) (CI = 95% Confidence Interval)</td>
</tr>
<tr>
<td>Infant Case Mix Group (&gt;2500 g normal versus other)</td>
<td>** Chi square p&lt;0.01</td>
<td>(CI 1.5 - 2.7)</td>
</tr>
<tr>
<td>Prenatal Education</td>
<td>*** Chi square p&lt;0.001</td>
<td>OR = 4.3</td>
</tr>
<tr>
<td>attendance (attendees versus non-attendees)</td>
<td>** Chi square p&lt;0.01</td>
<td>(CI 1.5 - 8.1)</td>
</tr>
<tr>
<td>Parity (multiparas versus primiparas)</td>
<td>* Chi square p&lt;0.05</td>
<td>OR = 1.6</td>
</tr>
<tr>
<td>Induced (yes versus no)</td>
<td>Chi square p&lt;0.001</td>
<td>(CI 1.1 - 2.3)</td>
</tr>
<tr>
<td>Maternal Case Mix Group (CMG 611 – uncomplicated delivery versus Other)</td>
<td>* Chi square p&lt;0.05</td>
<td>OR = 1.5</td>
</tr>
</tbody>
</table>

R² for the model is 0.096

### TABLE IV

<table>
<thead>
<tr>
<th>Readmission Timeframe</th>
<th>Readmitted Earlier Discharge (n = 137)</th>
<th>Not Readmitted Earlier Discharge (n = 1220)</th>
<th>Significance (Longer vs Earlier) Crude Odds Ratio (OR) (CI = 95% Confidence Intervals)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infant 7-14 days</td>
<td>3</td>
<td>8</td>
<td>OR = 4.66 (CI 1.23 - 7.64)*</td>
</tr>
<tr>
<td>Infant First Year (12 months)</td>
<td>78</td>
<td>59</td>
<td>OR = 1.35 (CI 0.94 - 1.93)††</td>
</tr>
<tr>
<td>Mother First Year (12 months)</td>
<td>64</td>
<td>46</td>
<td>OR = 1.26 (CI 0.85 - 1.88)††</td>
</tr>
</tbody>
</table>

* Chi square p<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. 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 (X² 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, 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 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. 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%).

Two randomized trials with home visitation following earlier discharge did not provide similar infant readmission rates. This study’s findings differed from several studies where an increased risk of infant readmission was associated with earlier discharge at <48 hours and 48 to <72 hours. 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%) but are higher than rates reported in several US studies (0.5-0.81%). 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 Groupings, and c) the quality of data from 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.

REFERENCES
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Received: February 7, 2001
Accepted: October 22, 2001