

Post-maternity Outcomes Following Health Care Reform in Alberta: 1992-1996

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ABSTRACT

Objective: The effect of Alberta's health reform on length of stay for maternity cases and on subsequent mothers' rehospitalization was examined in the present study.

Methods: The data set included all Alberta acute care hospital separation records from 1991/92 to 1996/97 inclusive. A logistic regression was applied to the data in order to examine the effects of prepartum condition, type of delivery, length of stay, maternal age, and year on the likelihood of readmission.

Results: Health reform proved to be associated with a dramatic decrease in length of stay for maternity cases; from 3.8 to 2.4 days on average. This was accompanied by very little variation in the 90-day readmission rate for mothers over the same time period (notably, a slight decrease). Higher readmission rates were associated with the existence of difficulties during the pregnancy and other prenatal conditions, maternal age, and with the type of delivery. There were no dramatic changes in the rates for prepartum diagnoses, nor for the type of delivery.

Discussion: The data suggest that the reduction in the length of maternity stay has had no discernible negative health effects on new mothers, perhaps because of the home visiting programs that were put in place. Furthermore, there may still be room to improve outcomes by focussing on those with prepartum conditions and cases involving complicated births.

La traduction du résumé se trouve à la fin de l'article.

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In recent years, there has been a clear reduction in the length of time that mothers and their newborn infants stay in hospital after delivery, from 5 or 6 days in the 1980s to about 3 days or less in the 1990s. In both Canada¹ and the United States,^{2,3} this reduction has been largely driven by cost-saving initiatives, and has been the subject of ongoing controversy about whether this reduced time in hospital is associated with increased health risks for the mother and infant. The present study focusses on the health outcomes of the mother.

The majority of studies in this area have focussed on infant health. The results are mixed, but more recent studies have been more likely to show an association between reduced length of stay and increased readmission rates. Lee et al., in a 1995 paper, found that early discharge was accompanied by a doubling of readmissions during the first postnatal week.⁴ These authors noted that the early studies were beset by methodological problems. Since then, associations between reduced length of stay and increased infant postnatal readmissions have been found in Canada⁴⁻⁶ and the United States,⁷⁻⁹ with dissenting findings (no association) from one American investigation¹⁰ and from one in Sweden.¹¹

There is a relatively small body of literature on maternal outcomes. A Washington state investigation found that maternal rehospitalization was greatly affected by type of delivery, with births by caesarean section showing the highest rates and assisted vaginal deliveries showing a slight increase over an uncomplicated vaginal birth. Mothers who were discharged early showed slightly elevated readmission rates (relative risk values ranged from 1.1 to 1.6).¹² Bossert and colleagues, employing a prospective design, found that reduced hospital stay was not associated with increased maternal morbidity.¹³ However, the design of the study was "AB" in nature. That is, routine care was studied for 3 months followed by the early discharge intervention for the next 3 months, with no reversal of order or comparison group to control for any confounding effects of the sequencing of the two length of stay policies. In a Connecticut, US study, mothers who stayed only one night in hospital reported greater personal distress (e.g., fatigue, worry) and more morbidity among their newborns than those

who had stayed longer.¹⁴ Readmission rates did not differ significantly, however, and the assignment to groups was not random, suggesting the possibility that any apparent effects may have been due to pre-admission conditions.

The present study will examine maternal health in Alberta, Canada over a time span covering the implementation of health reform that was designed to change practice and reduce costs. A significant feature was a policy designed to reduce the average length of stay (ALOS) in hospital for a variety of conditions, including maternity. Of particular relevance to the present study was the formation of a public health nursing program for maternity cases. Maternity patients were expected to be seen within 24 hours following discharge and followed for several days with some form of daily contact.

The purpose of this study was to determine whether there was a reduction in maternity ALOS in Alberta hospitals following provincial health reform and, if a reduction occurred, was it associated with any change in post-discharge readmission rates for the mothers in question.

Research Questions

- Question 1.** Was the ALOS for maternity cases reduced over the course of reform?
- Question 2.** Was this expected reduction associated with changes in post-natal hospital readmissions for the mother?
- Question 3.** Were these post-partum events, and the ALOS, associated with prepartum conditions and/or type of delivery?

METHODS

Data source

Hospital separation records for all maternity patients discharged from acute care hospitals in Alberta between 1991/92 and 1996/97 were extracted from the Canadian Institute for Health Information abstract file held by Alberta Health and Wellness. This six-year span covers the transition period of health reform in Alberta, with the first two years being seen roughly as pre-reform, the second two years covering the implementation period, and the final

TABLE I

Maternity Separations from Alberta Hospitals by Type of Delivery, Prepartum Conditions, and Readmissions: 1992-1996

		1992	1993	1994	1995	1996
Basic Case Data	Separations	41,926	40,255	39,780	38,841	37,804
	Days	158,757	134,142	108,107	93,466	91,881
	ALOS	3.8	3.3	2.7	2.4	2.4
Separations by Type of Delivery	Assisted	14.3%	14.6%	15.4%	15.5%	15.7%
	C-Section	15.8%	15.7%	15.6%	15.6%	13.1%
	Induced	9.2%	10.2%	10.6%	11.7%	11.0%
	Normal	60.7%	59.5%	58.4%	57.2%	60.2%
Cases Across Prepartum Condition	Delivery	1.4%	1.5%	1.4%	1.3%	1.3%
	Multiple	0.7%	0.6%	0.5%	0.5%	0.5%
	Fetal	0.6%	0.6%	0.5%	0.4%	0.4%
	Pregnancy	4.1%	4.0%	3.8%	3.4%	3.4%
	N/A Pregnancy	2.6%	2.4%	2.2%	2.0%	1.9%
Cases Across Readmission Type	None	90.7%	90.9%	91.5%	92.3%	92.6%
	Hem/Ret	0.73%	0.73%	0.69%	0.66%	0.70%
	Infection	0.61%	0.65%	0.70%	0.57%	0.61%
	Misc.Cond.	1.18%	1.32%	1.13%	1.00%	1.00%
	Multiple Conds.	0.09%	0.08%	0.10%	0.09%	0.07%
	None	97.4%	97.2%	97.4%	97.7%	97.6%

two years being viewed as post-reform. The new health legislation was enacted in June of 1994.¹⁵ Index records were selected for analysis from the five calendar years 1992 to 1996. This abbreviated time period provided the ability to gather prenatal and post-discharge data on all cases. Thus, the presentation of the results of this study will focus on these five years, not on the six-year period from which the data were originally drawn. The information was restricted to data about the mother (not the newborns), and did not include any information on non-hospital births (2 to 5 per 1,000 births over the study period¹⁶).

Measures

The primary measure here was post-delivery readmission rate. In response to the concerns raised in the studies noted above, data were included on type of delivery and prepartum diagnoses. These variables were constructed from International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9CM) codes,¹⁷ and are described in greater detail below. Readers may contact the corresponding author for information on the diagnostic codes associated with prepartum groupings and readmission categories. The set of independent variables also included the year of admission and maternal age. The latter variable was included because of anticipated differential effect of age on health outcomes. Both younger and older mothers have shown higher risk for mortality¹⁸ and, in Alberta, for poor outcomes such as stillbirth deliveries and low birth-weight.¹⁹

Delivery

Deliveries, excluding abortions, were assigned to one of four categories based on primary ICD-9-CM procedure codes as follows:

1. Caesarean Section (74.0 – 74.9)
2. Assisted Delivery (72.0 – 72.9, 73.2, 73.3)
3. Induced Delivery (73.1, 73.4)
4. Normal Delivery (all other cases)

Prepartum diagnoses

All prepartum diagnoses that were assigned up to and including 180 days prior to the delivery admission were included for analysis. The diagnoses were grouped into three categories:

1. Problems of pregnancy (including problems of the fetus) – (Pregnancy)
2. Problems not directly associated with pregnancy – (N/A Pregnancy)
3. Problems during delivery – (Delivery)

Readmissions

All maternal readmissions within 90 days of discharge from the delivery hospitalization were included for analysis. These were grouped into four categories on the basis of the primary ICD-9 diagnostic code that was assigned to the event. The resultant categories were 1) hemorrhage/retention of tissue, 2) infections, 3) miscellaneous conditions, and 4) multiple conditions.

RESULTS

Overall changes

Of note (see Table I) is the finding that both the number of separations for child-

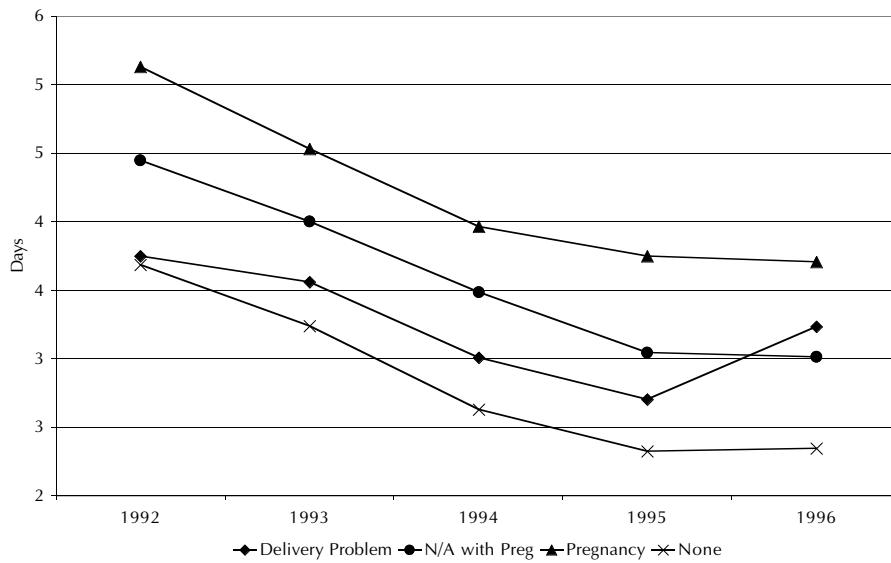


Figure 1. Change in maternal ALOS during delivery as a function of prepartum condition

This has shown a small but steady increase over the period of the study.

The importance of the prenatal condition of the mother is evidenced by a differential effect on delivery ALOS. Figure 1 shows that the ALOS was considerably shorter for those women who showed no prepartum diagnosis. With the exception of delivery problems in 1996, the decline in ALOS over time was remarkably similar for all prepartum conditions. The reason for the rise in 1996 is not clear, but it suggests a change in policy at that time.

Prepartum conditions and type of delivery

While normal, uncomplicated vaginal births prevail in all prepartum conditions, the findings here also indicate that those without a prenatal diagnosis are more likely to have a normal delivery than those with a pre-existing condition (see Table II). On the other hand, additional procedures of a significant nature are required in nearly 60% of the mothers who experienced prepartum problems of pregnancy and early signs of delivery difficulties.

Readmission diagnoses

The distribution of post-partum diagnoses across years showed very little variation within diagnostic categories (see Table I), the largest range being 0.5 (97.2% to 97.7%) for “None”. The resulting overall figures were 0.7% for hemorrhage/retention, 0.6% for infection, 1.1% for miscellaneous conditions, and 0.1% for multiple conditions. For further analysis, the four diagnostic categories were collapsed and expressed as the percentage of cases that were readmitted within 90 days of discharge.

Figure 2 indicates that those with delivery problems showed the highest likelihood of being assigned a post-discharge diagnosis. The other two prepartum categories were lower, but were nonetheless more than twice the rate for those without a diagnosis. It is interesting that it made little difference whether the prepartum problem was thought to be related to the pregnancy or not.

There was little change in the annual proportion that was readmitted. The unadjusted values were 2.6%, 2.8%, 2.6%, 2.3%, and 2.4% for the years 1992 through 1996, respectively. To control for

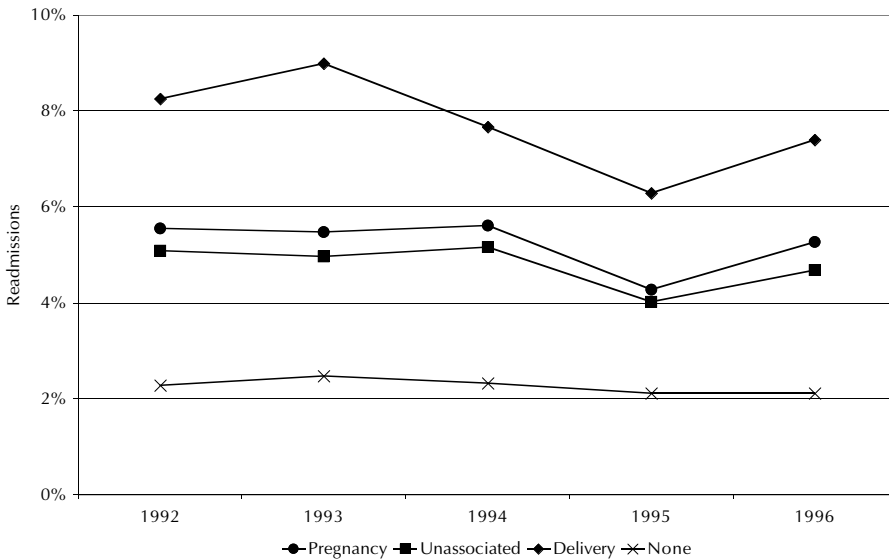


Figure 2. The effect of prepartum condition on the proportion readmitted: 1992-1996

birth and the ALOS have decreased significantly (10% and 36%, respectively) over the five years covered by this study. Both of these affect the total number of days spent in hospital, with the result being that maternity hospital days were reduced by 42% over the 1992-1996 period.

Type of delivery

Table I shows the distribution of cases for each type of delivery over the term of the study. The proportion of cases within each category showed only slight deviations over time. Normal deliveries showed a steady decline from 60.7% to 57.2% over

the first four years, rebounding to 60.2% in 1996. This was largely accounted for by a mirror-image increase in inductions over the years 1992-1995 (9.2% to 11.7%), followed by a drop to 11.0% in 1996. Assisted deliveries also contributed to the decline in normal births as they increased steadily from 14.3% to 15.7%. Caesarean deliveries remained constant over the first four years, but dropped by more than 2% in 1996.

Prepartum conditions

Table I shows that over 90% of the mothers-to-be presented with no prenatal diagnosis.

bias due to other factors that are associated with readmission rate, a logistic regression was applied to the data with readmission serving as the dependent variable. The independent variables included LOS (days), prepartum condition (PRE; any condition, present or absent), delivery type (DEL; "abnormal" vs. "normal"), YEAR, and AGE. Age categories were <20, 20-29, 30-39, and 40+ years, with the 30-39 grouping serving as the base because it proved to have the lowest readmission rate. Since the LOS variable reflects variation in length of stay within years as well as across years, the LOS by YEAR interaction was included in the model to allow for a better estimate of the contribution of these two factors.

Table III shows that the multivariate analysis (which shows odds ratios adjusted for variations in all other factors in the model) produced values that are not appreciably different from the univariate (unadjusted) analysis. The results show that the strongest predictors of readmission were the existence of a prepartum condition, the presence of a non-routine delivery, and maternal age. Teen mothers showed the highest readmission rate. Those aged 40 and over showed an increase that was not statistically significant, but it should be noted that readmissions increased with age within this group. It is noteworthy that the variables that are a reflection of Alberta's health reform, LOS and YEAR, showed much smaller effects. The adjusted odds ratio for YEAR indicates that over the course of the study period, the likelihood of readmission went down. However, the LOS adjusted odds ratio indicates that each one-day drop in stay was associated with an increase in the likelihood of readmission. The first of these two findings casts a positive light on health reform and the latter suggests a negative interpretation. The resolution of this disparity is found in the interaction between LOS and YEAR. This indicates that the negative association between length of stay and readmission showed little change over the study period, but the change that did occur reflected a weakening of this association.

DISCUSSION

Our analysis showed that the reduction in length of stay for maternity cases was not

TABLE II

The Distribution of Delivery Type for Each Prepartum Condition

Delivery Type	Prepartum Problem			
	Pregnancy	N/A Pregnancy	Delivery	None
Assisted	15.2%	15.5%	17.7%	15.0%
C-Section	24.9%	17.9%	27.0%	14.4%
Induced	17.0%	14.3%	14.8%	10.0%
Normal	42.9%	52.4%	40.5%	60.5%
Total	100.0%	100.0%	100.0%	100.0%

TABLE III

Logistic Regression of the Five Independent Variables and the LOS x Year Interaction on Readmission Within 90 Days: 1992-1996

		Univariate		Multivariate	
		OR	p <	OR	p <
LOS	Length of Stay	1.02	0.0001	0.94	0.0001
PRE	Prepartum Problem	2.54	0.0001	2.33	0.0001
DEL	"Abnormal" Delivery	1.60	0.0001	1.58	0.0001
YEAR	Overall Linear	0.96	0.0001	0.92	0.0001
AGE	<20 vs 30-39	1.72	0.0001	1.63	0.0001
	20-29 vs 30-39	1.28	0.0001	1.26	0.0001
	40+ vs 30-39	1.16	0.28	1.11	0.45
LOS x YEAR				1.01	0.002

accompanied by any discernible risk to the mother as measured by readmission rate. This may well be a testimony to the Public Health Nursing follow-up program that was put in place as part of health reform, but it should be noted that we were not testing the specific components of health reform here. It was clear, however, that rehospitalization was strongly associated with prenatal problems and with the type of delivery. This serves to demonstrate the sensitivity of our outcome measure to such effects. Thus, there is no evidence here that any benefit would be produced by increasing the length of stay. The most likely source of benefit would appear to be attention paid to pre- and perinatal conditions.

The outcome measure that was used here, readmission to hospital, might be seen as relatively restrictive, and an investigation of post-natal visits to specialist and family physicians would have provided a more comprehensive picture. While this sort of enquiry would likely be quite valuable, its absence does not weaken the conclusion being drawn here. If office visits were taken to represent a serious consequence of changes in maternity practices, then it would be unlikely that this category could show a meaningful shift without a concomitant change in rehospitalization rate. This would be like the proverbial iceberg without a tip. At worst, we would have an effect whose seriousness was limited to physician office visits. However, Lane and colleagues have indicated that early

release causes mothers to worry.¹⁴ Perhaps this concern might lead to a post-discharge consultation to allay any fears that may exist. In any case, a study of post-discharge physician office visits would provide useful information and could serve as a test of the just-expressed hypothesis.

It is possible that a reduction in bed availability over the course of health reform in Alberta might have suppressed any likelihood of increased readmissions. This is certainly an area for further study. However, had there been a need for readmissions that could not be realized because of bed restrictions, this would likely have been accompanied by a change in the pattern of readmission diagnoses as cases were selected on the basis of severity. What we did find was a barely discernible reduction in readmissions with almost no change in the diagnostic mix.

It should be reiterated that the findings reported here pertain to the health of the mothers only. Health of the newborn may well be a different matter. Future investigations would benefit from the trend toward more comprehensive data bases that would include mother and child outcome data as a matter of course.

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RÉSUMÉ

Objectif : Cette étude porte sur l'effet de la réforme de la santé en Alberta sur la durée du séjour à l'hôpital après l'accouchement et sur les réhospitalisations subséquentes des mères.

Méthode : Nous avons étudié les données de tous les registres de sortie des hôpitaux albertains de soins actifs, de 1991-1992 à 1996-1997, inclusivement. Nous les avons analysées par régression logistique pour déterminer les effets de diverses variables (état de santé avant l'accouchement, mode d'accouchement, durée du séjour, âge maternel et année) sur la vraisemblance d'une réadmission.

Résultats : La réforme de la santé était associée à une réduction considérable de la durée du séjour à la maternité, qui est passé de 3,8 à 2,4 jours en moyenne. Elle s'est accompagnée d'un très faible écart (en fait, une légère baisse) dans le taux de réadmission des mères dans un délai de 90 jours pendant la même période. Les taux de réadmission élevés étaient associés aux grossesses difficiles et autres troubles prénatals, à l'âge maternel et au mode d'accouchement. Il n'y a pas eu de changements considérables dans les taux associés au diagnostic avant l'accouchement ou au mode d'accouchement.

Discussion : Ces données portent à croire que la réduction de la durée du séjour à la maternité n'a eu aucun effet néfaste évident sur la santé des nouvelles mères, peut-être en raison de la mise en place de programmes de visites à domicile. En outre, il serait encore possible d'améliorer ces résultats en mettant l'accent sur les mères dont la grossesse a été difficile et les naissances avec complications.