Effect of a Reduced Postpartum Length of Stay Program on Primary Care Services Use by Mothers and Infants

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Abstract. ***Objective.*** **To determine the impact of reduced postpartum length of stay (LOS) on primary care services use.**

Methods. Design: **Retrospective quasiexperimental study, comparing 3 periods before and 1 period after introducing an intervention and adjusting for time trends.** ***Setting*****: A managed care plan.** ***Intervention:*** **A reduced obstetrical LOS program (ROLOS), offering enhanced education and services.** ***Participants:*** **mother-infant dyads, delivered during 4 time periods: February through May 1992, 1993, and 1994, before ROLOS, and 1995, while ROLOS was in effect.** ***Independent Measures:*** **Pre-ROLOS or the post-ROLOS year.** ***Outcome Measures:*** **Telephone calls, visits, and urgent care events during the first 3 weeks postpartum summed as total utilization events.**

Results. **Before ROLOS, LOS decreased gradually (from 51.6 to 44.3 hours) and after, sharply to 36.5 hours. Although primary care use did not increase before ROLOS, utilization for dyads increased during ROLOS. Before ROLOS, there were between 2.37 and 2.72 utilization events per dyad; after, there were 4.60. Well-child visits increased slightly to .98 visits per dyad, but urgent visits did not.**

Conclusion. **This program resulted in shortened stays and more primary care use. There was no increase in infant urgent primary care utilization. Early discharge programs that incorporate and reimburse for enhanced ambulatory services may be safe for infants; these findings should not be extrapolated to mandatory reduced LOS initiatives without enhancement of care.** ***Pediatrics*** **2000;106:937–941;** ***infant, newborn; length of stay, early discharge, outcomes, health services utilization, pregnancy, postpartum, patient discharge.***

ABBREVIATIONS. LOS, length of stay; HCHP, Harvard Community Health Plan; ROLOS, Reduced Obstetrical Length of Stay program; BWH, Brigham and Women's Hospital; SD, standard deviation.

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The average length of a postpartum hospitalization was 3.9 days in 1970, dropping to 2.1 by 1992.[1] With nearly 4 million births annually in the United States,[2] even minor reductions in postpartum care costs could result in substantial savings.

In response to growing professional and public concern regarding shortened postpartum stays, mandatory under some health plans, many state legislatures passed laws requiring insurers to pay for postpartum stays of 2 days. In 1996, Congress passed the Newborns' and Mothers' Health Protection Act, which prohibits payers from restricting "benefits for any hospital LOS in connection with childbirth for the mother or newborn child, following a normal vaginal delivery, to less than 48 hours." The law went into effect in 1998,[3] recognizing women and physicians' rights to exercise judgment in decision-making about aptness of discharge timing.[4,5]

The heated debate on the optimal postpartum length of stay (LOS) stays occurred in a setting of limited data regarding the health outcomes and effects.[6,7] Reducing postpartum LOS may influence ambulatory care use in intended and unintended ways. Primary care use may increase simply as the responsibilities for postpartum education and follow-up are shifted into the home and outpatient settings. For example, an early discharge program may routinely include earlier or more frequently scheduled office and home visits. At the time of the study, standard recommendations were for newborns to follow-up within 48 hours for any newborn discharged early.[8] Alternatively, an increase in primary care use may be the result of adverse medical or social consequences of early discharge.

We conducted a retrospective study of primary care utilization patterns for patients enrolled in a voluntary reduced postpartum stay program. In late 1994, before state or federal legislation regulating reimbursements for postpartum LOS, a large managed care organization, Harvard Community Health Plan (HCHP)—now Harvard Vanguard Medical Associates—implemented the Reduced Obstetrical Length of Stay (ROLOS) program.[9] The ROLOS program facilitated next day discharge of mothers, offered enhanced prenatal educational classes, implemented risk assessments to exclude high-risk patients, made available postpartum breastfeeding

counseling, and arranged postpartum home visitation.

Our study objective was to measure the quantitative impact of ROLOS on postdischarge primary care health services utilization during the first 3 weeks after delivery.

METHODS

The study included patients receiving routine care at HCHP centers who had delivered at the Brigham and Women's Hospital (BWH). It was conducted as a retrospective quasiexperimental study, adjusting for time trends. Four periods were studied: February through May of each year, 1992, 1993, and 1994, before the implementation of ROLOS, and 1995, while ROLOS was in effect. The time period in each study year was chosen so that data from 1995 could be linked with previously collected survey data.[10]

Hospital Discharges

Mother-infant dyads and their demographic and limited clinical data were obtained from the BWH clinical database. Participants were eligible if: 1) delivery occurred during the specified time periods; 2) they were assigned either Diagnosis-Related Group code 372 (vaginal delivery with complicating diagnoses) or 373 (vaginal delivery without complicating diagnoses); and 3) the mother had coverage by HCHP. Patients were excluded for the following reasons: 1) residence outside of Massachusetts; 2) admission of the infant to the special care nursery for >24 hours; 3) birth weight <2200 g; 4) gestational age <36 weeks; 5) twin or multiple birth; 6) maternal or newborn postpartum LOS >99 hours; 7) assignment of any 1 of a predetermined group of serious maternal or newborn secondary medical diagnoses (previously reported).[10]

Matching Hospital and Health Plan Medical Records

Primary care records for mothers were identified using a common identification number in the hospital and ambulatory record. Infant primary care records were identified by matching using a common identification number, or where necessary, a street address or last town of residence. The strategy for matching infants to mothers was successful for 100% of dyads; 79.2% were matched by HCHP family number and the remainder by town and street.

Chart Abstraction

All entries in the electronic record were printed for mothers and infants for the 21 days after each birth. One reviewed abstracted the infants' charts and the other reviewed the mothers' charts and entered the data into a relational database (Borland Paradox Version 7.0, Scotts Valley, CA).

Survey Data

Detailed demographic data were available from a previous study on the mother-infant dyads in our study who had deliveries in 1995 (the ROLOS year).[10]

Independent Variables

The primary independent variable was whether the birth occurred in a pre-ROLOS (1992, 1993, 1994) or the post-ROLOS year (1995).

Demographic Variables

Basic demographic information, specifically maternal age, race, parity, and marital status, were derived from the hospital's clinical database. Race data and marital status were based on self-report to a registration secretary at the time of admission.

Trends Over Time

A variable to allow adjustment for secular trends, treated as a trend variable with 4 possible values (92, 93, 94, 95), was also included in the model.

Outcome Measures

The main dependent variable was a summary variable called total combined utilization, the sum of the number of postpartum primary care utilization events for each mother-infant dyad. These events included routine well-child visits, routine postpartum checks, urgent care visits, home visits, and telephone calls. For calculating this variable, a home visit in which the mother and infant were both cared for was counted only once. Secondary outcome measures included total infant utilization, total maternal utilization, the individual components of the total utilization variable, and rates of visits within specified diagnostic categories.

Analysis

The data were analyzed using multivariate regression, testing for the effect of ROLOS, while adjusting for secular time trends. Contained in the model were the dichotomous ROLOS variable (pre- or post-) and year as a trend variable. All analyses were conducted with The SAS System for Windows, Version 6.12, (SAS, Cary, NC). Using a 2-sample method, minimum detectable differences in mean utilization rates between 1992 and 1995 were calculated using an α error of .05 and a β error of .20.

RESULTS

A total of 1315 dyads were included in the study, with >300 from each of the 4 years. Characteristics of the population are shown in Table 1. Mother-

TABLE 1. Characteristics of the Population

	Overall	Pre			Post 1995 $n = 313$	P for Trend	P for ROLOS
		1992 $n = 328$	1993 $n = 315$	1994 $n = 359$			
Mothers							
Age in y, mean SD	30.3 (5.1)	30.1 (5.0)	30.3 (5.1)	30.6 (5.2)	30.2 (4.9)	.15	.18
Race, *n* (%)							
White	889 (67.6)	217 (66.2)	204 (64.8)	247 (68.8)	221 (70.6)	.45	.79
Black	250 (19.0)	72 (22.0)	69 (21.9)	61 (17.0)	48 (15.3)		
Hispanic	74 (5.6)	18 (5.5)	17 (5.4)	22 (6.1)	17 (5.4)		
Asian	71 (5.4)	13 (4.0)	18 (5.7)	20 (5.6)	20 (6.4)		
Other	31 (2.3)	8 (2.4)	7 (2.2)	9 (2.5)	7 (2.2)		
Primapara, *n* (%)	511 (42.9)	133 (42.5)	111 (39.6)	138 (42.5)	129 (47.3)	.97	.28
Married, *n* (%)	1104 (84.0)	272 (82.9)	264 (83.3)	299 (83.3)	269 (85.9)	.90	.53
Infants							
Birth weight in g, mean SD	3507 (450)	3508 (463)	3475 (441)	3519 (434)	3523 (460)	.72	.82
Gestational age in wk, mean SD	40.1 (1.1)	40.2 (1.2)	40.1 (1.0)	40.3 (1.2)	40.1 (1.18)	.31	.13

infant dyads did not differ on these characteristics across the 4 years of the study.

Survey data were available on maternal educational level and income for participants from the 1995 year. In 1995 mothers from HCHP represented 37.4% of all deliveries at the BWH. Almost 8% had an annual household income <$20 000 and 26% had an annual income >60 000. Only 3.5% of mothers did not complete high school, and 58.7% had at least a college degree.

During the pre-ROLOS years (Fig 1), LOS trended downward (51.6 to 44.3 hours; $P < .001$). After the introduction of ROLOS, there was a larger reduction in LOS, with a drop to a mean of 36.5 hours ($P < .001$).

Although there was no secular trend toward increasing utilization before the introduction of ROLOS ($P = .52$), total combined utilization for mothers and infants increased significantly when ROLOS was introduced ($P < .001$). Mother-infant dyads had between 2.37 and 2.72 utilization events in each of the pre-ROLOS years (Table 2); in the post-ROLOS year, however, the average number of events rose to 4.60 (standard deviation [SD]: 2.85). Consistent with the program structure, there was a significant increase in the number of home visits ($P < .001$). In the pre-ROLOS years, the rate of home visits per mother-infant dyad ranged from .13 to .16, but post-ROLOS the rate rose to .70 (SD: .50; $P < .001$). The rate of home visits before the introduction of ROLOS had not been increasing ($P = .24$).

Total utilization for infants (Table 3A) rose after the introduction of ROLOS ($P < .001$). Before ROLOS, the rates of total infant utilization ranged from 1.64 to 1.90, while post-ROLOS, infants had an average of 2.79 visits (SD: 2.00) each. Well-child visits increased slightly in 1994 ($P = .04$), but urgent visits for infants did not ($P = .72$, minimum detectable difference .07). The number of clinically related telephone calls between mothers and physicians or nurses nearly doubled ($P < .001$) to an average of .90 phone calls per infant (SD: 1.21).

The total utilization for mothers also rose significantly with the introduction of ROLOS ($P < .001$, Table 3B). There was an increase in routine checks occurring within the first 3 weeks postpartum ($P < .001$). Although the rate of urgent visits was very low in both the pre- and post-ROLOS years, there was a secular trend of a decreasing rate in the pre-ROLOS years ($P = .03$) and a significant increase to .05 (SD: .24) visits per mother ($P < .001$). As for infants, the rate of telephone calls made within the first 3 weeks rose significantly to .85 (SD: 1.08) calls per patient ($P < .001$).

DISCUSSION

ROLOS was a well-defined program of postpartum care in a large managed care system. Clinical data were available in an electronic medical record system for all maternal and infant primary care use. After ROLOS was introduced, there was no increase in infant urgent primary care utilization. Although the number of maternal urgent primary care events went up, the rates of these events were very low, and in the ROLOS year, the rate was actually the same as in 1992. Mothers and infants used more primary care services in the ROLOS year. Much of this increase appears to be a result of scheduled routine follow-up visits and scheduled home visits. Clinically related telephone calls about maternal and infant issues also increased. Whether the parent or the clinician initiated the call is not discernable from these data.

Previous work has also has shown that with implementation of comprehensive reduced stay programs, primary care use may increase.[11] By using a time trend analysis, which allows adjustment for secular trends that may have contributed for an apparent effect in a before-after design, this study strengthens confidence in these results. Further, our study provides a fine grained analysis of the effect of LOS on the type of primary care services, with the outcome broken down into well-child visits, urgent care visits, home visits, and telephone calls.

Infant urgent care visits may be a marker of adverse outcomes. That infant urgent care use did not increase is reassuring, although given our sample size we may have missed a small increase. We had the power to detect a rise in urgent care use between 1992 and 1995 from .09 to .16 per patient. However, compared with the actual power of the regression model, the 2-sample power analysis substantially underestimates the power to detect differences and overestimates the magnitude of minimum detectable differences. Other events, not captured in the current study, such as hospitalizations and emergency department visits may also serve as proxies for important adverse outcomes.

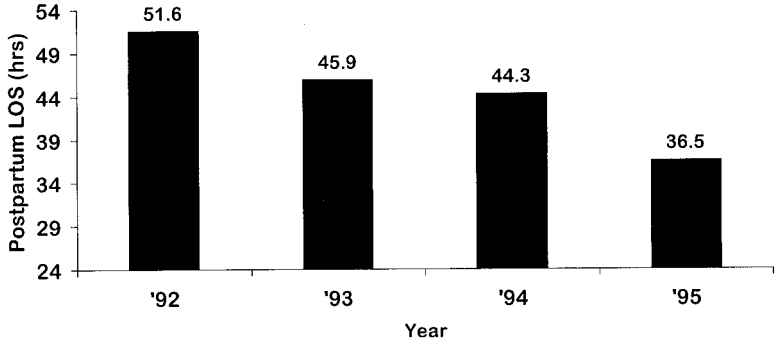

Fig 1. Mean maternal postpartum length of stay.

TABLE 2. Combined Mother and Infant Utilization*

	Pre			Post 1995 $n = 313$	*P* for Trend	*P* for ROLOS	Minimum Difference†
	1992 $n = 328$	1993 $n = 315$	1994 $n = 359$				
Total combined utilization	2.37 (2.14)	2.60 (1.79)	2.72 (2.32)	4.60 (2.85)	.52	<.001	.47
Any home visit	.13 (.39)	.15 (.40)	.16 (.43)	.70 (.50)	.24	<.001	.09

* Mean number of utilization events in the first 3 weeks postpartum SD.
† Minimum difference detectable with β error of .2 and two tailed α error of .05.

TABLE 3A. Infant Utilization*

	Pre			Post 1995 $n = 313$	*P* for Trend	*P* for ROLOS	Minimum Difference†
	1992 $n = 328$	1993 $n = 315$	1994 $n = 359$				
Total infant utilization	1.64 (1.52)	2.01 (1.15)	1.90 (1.80)	2.79 (2.00)	.06	<.001	.34
Well-child visits	.84 (.61)	.93 (.46)	.85 (.52)	.98 (.52)	.94	.04	.14
Urgent visits	.09 (.31)	.13 (.35)	.11 (.37)	.13 (.40)	.55	.72	.07
Telephone calls	.45 (.87)	.50 (.84)	.53 (.98)	.90 (1.21)	.25	<.001	.19
Home visits	.07 (.27)	.12 (.35)	.12 (.39)	.40 (.51)	.10	<.001	.06

TABLE 3B. Maternal Utilization*

	Pre			Post 1995 $n = 313$	*P* for Trend	*P* for ROLOS	Minimum Difference†
	1992 $n = 328$	1993 $n = 315$	1994 $n = 359$				
Total maternal utilization	1.64 (1.52)	2.01 (1.15)	1.90 (1.80)	2.79 (2.00)	.18	<.001	.34
Routine visits	.31 (.58)	.25 (.44)	.34 (.50)	.50 (.60)	.54	<.001	.13
Urgent visits	.05 (.23)	.01 (.12)	.02 (.15)	.05 (.24)	.03	.011	.05
Telephone calls	.21 (.55)	.24 (.53)	.34 (.70)	.85 (1.08)	.02	<.001	.12
Home visits	.08 (.28)	.09 (.29)	.11 (.31)	.63 (.48)	.27	<.001	.06

* Mean number of infant utilization events in the first three weeks postpartum (standard deviation).
† Minimum difference detectable with beta error of 0.2 and two tailed alpha error of 0.05.

Several previous investigations also found no increase in hospital readmission rate for newborns discharged early,[10,12,13] while a Washington State study found slightly increased odds of newborn readmission.[14]

Measurement of the use of health care services provided during the first weeks postpartum is needed to model the cost and consequences of early discharge. Some additional planned services, such as early follow-up at home or in clinics and offices, may be necessary to compensate for reduced in-hospital monitoring and education. Our finding that the frequency of infant urgent care visits did not increase may be attributable to the planned additional care provided under ROLOS, such as primary care follow-up, provider-initiated phone calls and home visits. Evidence in the literature suggests that home visits after early discharge improve outcomes.[15] Primary care office visits after early discharge have been demonstrated to be as effective as home visits,[16] although not all practitioners provide early follow-up for mothers and newborns discharged early.[17,18]

The study had some limitations. Not all patients in the ROLOS year were enrolled in ROLOS. This study was conducted as an intention to treat study. As such, our analyses do not distinguish whether the ROLOS patients per se were the ones with increased total utilization. Further, as a voluntary program, there may have been self-selection by patients in choosing to enroll. These results, then, apply only to the policy of offering a voluntary program of early discharge, not a program mandating such discharges. In addition, the program studied, ROLOS, offered only a moderately early discharge with mothers staying an average of 36.5 hours postpartum. Assessment of outcomes after postpartum stays <1 day will require further study. Most mothers enrolled in ROLOS were relatively well-educated and from households with relatively high incomes. Also, they were screened for both medical and social risk factors before the decision to discharge.[9] Our findings should not be directly applied to populations with more limited resources or at higher medical risk. Ironically, individuals with social risk factors have been shown to be more likely to be discharged early.[19]

CONCLUSION

The ROLOS program, by design, reduced LOS with a compensatory increase in ambulatory visits. As intended, it did result in both shortened LOS and an increased amount of primary care use. Reassuringly, most of the additional use appears to have been accounted for by planned visits (to both home and office) and telephone calls. Programs that incorporate and reimburse for enhanced ambulatory services may be safe for infants. Comprehensive primary care services may compensate for early discharge from the hospital. These findings

should not be extrapolated to mandatory reduced LOS initiatives without enhancement of care. Mothers and physicians should consider the availability of such care in their decision on an optimal LOS. The net cost of substituting ambulatory services for additional hours in the hospital requires further study.

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