Health Service Use Among Low-Risk Newborns After Early Discharge With and Without Nurse Home Visiting

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Background: To examine the potential benefits of routine nurse home visiting after early discharge, we compared health service use among low-risk newborns with and without a nurse home visit and telephone follow-up after short hospital stays.

Methods: Records of newborns discharged routinely before (n = 83) and after (n = 91) implementation of a universal postpartum home visiting program were reviewed retrospectively. Acute care visits, rehospitalizations, and well-baby visits for newborns up to 74 days of age were compared between the groups.

Results: Acute care visits, rehospitalizations, and missed well-baby visits consistently appeared less likely among newborns receiving home visiting services, in both unadjusted and adjusted analyses. Adjusting for insurance, parity, and breast-feeding, a twofold reduction in acute care visits by 14 days was significant. Although not statistically significant, adjusted analyses of acute care and missed well-baby visits revealed apparently similar patterns at all time intervals. There were too few rehospitalizations for multivariate analysis.

Conclusions: Despite the limitations of this small retrospective study, the consistency of the findings suggests potentially important benefits of home visiting services after early discharge of low-risk newborns, with substantial implications for clinical and reimbursement policy. Effects could be greater with more vulnerable populations and shorter stays than those in this study. (J Am Board Fam Pract 1996;9:254-60.)

Although early discharge has become standard in the United States, the medical literature provides little evidence of associated outcomes^{1,2} and little guidance about practices in the period immediately following early discharge.² Although the American Academy of Pediatrics recommends routine clinical follow-up in the first few days if newborns leave the hospital early (defined as before 48 hours after uncomplicated vaginal delivery),³ what is meant by early and associated follow-up practices varies considerably. At many institutions routine plans following 24- to 48-hour stays are a wellbaby visit at 2 weeks with additional consultation only if problems arise; however, no adequately

This project was funded by support from the Academic Senate of the University of California, San Francisco, School of Medicine. designed studies have shown the safety or advisability of this practice.² Many providers routinely recommend an office or clinic visit at 1 to 3 days following a hospital stay of less than 24 hours, but maternal or infant consequences have not been adequately studied, and no-show rates for an early clinic visit after discharge appear high among lowincome populations.²

Early discharge followed by two or more nurse home visits has not appeared to be associated with significant differences in morbidity among selected populations who are privately insured, carefully screened psychosocially as well as medically, and well-prepared antenatally²⁻⁷; however, no published study has had the statistical power to detect a clinically significant effect on readmissions. The safety of early discharge in the absence of two or more home visits has not been shown by any adequately designed study. Furthermore, the safety of early discharge with any type of postdischarge (postpartum) follow-up has not been established for populations who do not meet the stringent criteria used in previously published studies.²

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Early postpartum home visiting is universal in many European countries^{8,9} but has not been rigorously evaluated. Benefits of intensive home visiting for high-risk groups have been found in the United States¹⁰⁻¹⁴ but cannot be generalized to the low-risk population. Many third party payers do not provide coverage for routine postpartum home visits in the absence of clear medical or psychosocial indications. An increasing move toward capitated payment tends to discourage providers from ordering services that are not considered essential.

Although the literature does not provide sound evidence either of the safety or risks of early discharge, theoretical concerns arise from knowledge of the dramatic physiologic events occurring in newborns and mothers during the first few days after delivery and of the relatively common potential complications for which early detection and timely intervention lead to improved outcomes. Neonatal jaundice often peaks around the 3rd postnatal day. Breast milk might not come in before the 2nd or 3rd postpartum day, making it difficult to teach or support breast-feeding under current hospitalization practices; inadequate feeding can lead to severe neonatal dehydration and aggravate jaundice. Infection or breakdown of episiotomy wounds and several other obstetric problems generally do not become manifest until a few days following delivery. With shortened hospital stays, women and babies no longer undergo observation in the hospital during much of the vulnerable early period.

We undertook the current study to examine whether a single routine postpartum nurse home visit and accompanying telephone services were associated with improved outcomes after routine early discharge among a low-risk but socioeconomically diverse population.

Methods

We studied health service utilization among apparently well newborns and low-risk mothers during the first several weeks after relatively short stays with and without postpartum home visiting, taking advantage of a natural experiment. At the University of California San Francisco Medical Center (UCSF), routine practice changed in 1991 in response to provider concerns about the impact of progressively shorter perinatal stays. In April 1991 a routine postpartum nurse home visiting program covered by Medi-Cal (California's Medicaid program) and most private payers was offered to all San Francisco residents giving birth at UCSF. Trained nurses made clinical and psychosocial assessments and delivered home care, including health education, to mothers and newborns, consulting with physicians and making referrals according to standard protocols (available on request). Breast-feeding promotion was emphasized. Nurses made a home visit on the 2nd or 3rd postnatal day (1 to 2 days after discharge), were available by telephone for advice, and made a routine follow-up telephone call a few days later.

We retrospectively reviewed the UCSF inpatient and outpatient records of (1) 83 well newborns born during November 1989 through March 1990, when there was no additional routine follow-up recommended before the 2-week well-baby visit at the medical center (the no home visit group); and (2) 91 well newborns born during November 1991 through March 1992 who received a nurse home visit 1 to 3 days following discharge and the telephone services described above (the home visit group). Women in both the no home visit and home visit groups could call their individual pediatric providers or the pediatric emergency room at UCSF if they had concerns, but those in the no home visit group did not receive routine telephone calls. Practices were in transition in the time interval between the selected study periods. We included all babies born during the study periods who met eligibility criteria (below) on review, first of nursery logs and then of medical records.

To reduce the likelihood that other care sites were utilized, the sample was restricted to babies who were found in the nursery log to have a UCSF pediatric provider and whose UCSF medical records showed at least one visit (well-baby or acute care) during the first 74 days of life. UCSF provides 24-hour-a-day emergency and urgent pediatric services as well as comprehensive routine outpatient care. Babies were excluded if they had been admitted to the intensive care nursery. Mother and infant had to have been discharged home together within 48 hours after vaginal delivery, with no plan for other than routine followup care for either mother or baby noted in the log or newborn's hospital record. For example, babies were not included if public health nurse assess-

mated to compare outcomes between the no home visit and home visit groups.

Results

Table 1 shows sample characteristics of the study groups. There were no significant differences between the home visit and no home visit groups with respect to age, parity, race or ethnic group, or intention to breast-feed at discharge (examined as a marker of maternal health practices and attitudes and as a potential influence on maternal and newborn health status and use of care). The home visit group was significantly more likely to have Medi-Cal but about equally likely to have private third party coverage. The higher proportion covered by Medi-Cal appeared to correspond to a lower proportion who were uninsured, ie, without public or private coverage, suggesting that the difference in insurance coverage between the two groups is likely to reflect the higher income criterion for Medi-Cal maternity care eligibility (200 percent of poverty, up from 133 percent) implemented during late 1989 and early 1990, rather than a change in the socioeconomic mix of

charge (any breast-feeding ver-

sus exclusive use of formula).

Odds ratios and 95 percent confidence intervals (CIs) were esti-

Table 1. Characteristics of Sample Newbo	least one well-baby visit within	
No Home Visit	Home Visit at 2 to 3 Days of Age	following the expected timing

Maternal Characteristics	No Home Visit (n = 83) No. (%)	2 to 3 Days of Age (n = 91) No. (%)	P Value*	of the first recommended well- baby visit at 14 days. We hy-
Age, years 18-19 20-34 ≥ 35	4 (4.8) 70 (84.3) 9 (10.8)	7 (7.7) 70 (76.9) 14 (15.4)	0.46	pothesized that effects of differ- ent services received in the first few days after birth would di-
Parity [†] First birth 2nd birth or more	42 (50.6) 41 (49.4)	47 (52.2) 43 (47.8)	0.83	minish with time, especially af- ter the 2-week well-baby visit
Insurance Private Medi-Cal None	37 (44.6) 20 (24.1) 26 (31.3)	43 (47.3) 35 (38.5) 13 (14.3)	0.01	recommended for both groups. The data were analyzed using SASS/PC software. ¹⁵ Differ-
Race or ethnic group African-American Asian European-American Latina Other	14 (16.9) 14 (16.9) 31 (37.4) 6 (7.2) 6 (7.2)	16 (17.6) 23 (25.3) 35 (38.5) 10 (11.0) 7 (7.7)	0.87	ences between study groups in proportions and means were tested using chi-square and Stu- dent's t-tests of significance. Multivariate analyses were ad-
Feeding plans at time of delivery [‡] Breast-feed Formula	65 (79.3) 17 (20.7)	75 (85.2) 13 (14.8)	0.31	justed for insurance for newborn hospitalization (private, Medi- Cal none) mother's parity (first
Average newborn length of stay, hours	35.4 (± 1.15)	28.8 (± 0.84)	0.0001	birth or other), and intention to breast-feed at the time of dis-

*For difference between no home visit and home visit groups.

[†]Parity unknown for 1 mother in home visit group.

[‡]Feeding status unknown for 1 infant in no home visit group and 3 in home visit group.

ments for psychosocial or medical concerns or additional clinic visits (eg, for bilirubin checks) were ordered before discharge. Other eligibility criteria were San Francisco residence, a maternal age 18 years or older, and no suspected maternal drug abuse or psychiatric problem.

Data were abstracted from the infants' records

by medical students trained in record abstrac-

tion, using an instrument developed and pretested by the research team. We compared among infants in the two study groups the occurrence of acute care visits, rehospitalizations, and missed well-baby visits during time intervals selected to take into account the routine schedule of recommended well-baby visits, which was at 2 and 8 weeks throughout the study period. Acute care visits and rehospitalizations were examined during intervals up to 14, 21, 30, and 44 days of age, corresponding to the first 2 weeks and first month after birth and also within 1 week and 1 month of the first recommended well-baby visit at 14 days. Missed well-baby visits were examined up to 21, 44, and 74 days of age; these intervals permitted us to examine failure to receive at

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maternity patients at UCSF during this period. Although there were no significant differences in race or ethnicity or in feeding plans, the home visit group appeared to have more Latinas and fewer Asian-Americans and more women intending to breast-feed than did the no home visit group. Mean length of stay was significantly longer among no home visit versus home visit babies (35.4 versus 28.8 hours, respectively).

Age and race or ethnic group were not included in multivariate analyses because they did not differ significantly between study groups (Table 1), and supplementary analyses adjusting for those variables confirmed the findings presented here (not dis-

played; available on request). Although differences between the two groups in parity and intention to breast-feed were not statistically significant (Table 1), we adjusted for both of these variables in multivariate analyses because we hypothesized that differences in parenting experience and in health effects associated with breast-feeding could be particularly important factors influencing use of care.

The pattern of findings on all outcome measures was similar at all time intervals in both unadjusted and adjusted analyses (Tables 2 and 3) and consistently suggested benefits associated with home visiting following short newborn hospital stays. As shown in Table 2, in this low-risk sample, 27.7 percent of newborns in the no home visit group and 16.5 percent of those with a home visit had at least one acute care visit by 14 days of age. In multivariate analyses adjusting for insurance, parity, and intention to breast-feed (Table 3), babies in the no home visit group were significantly more likely to have at least one acute care visit by 14 days of age (adjusted odds ratio 2.30, 95 percent CI 1.05 to 5.05). Although results of unadjusted analyses and at other time intervals were not statistically significant, acute care visits consistently appeared more likely among babies in the no home visit group.

Rehospitalization rates were very low in both groups, precluding multivariate analysis and dictating particular caution in interpreting these results. The pattern appeared similar to that for acute care visits, however, with rehospitalization appearing more likely in the no home visit group (3.6 percent at both 14 and 21 days) than in the home visit group (1.1 percent at 14 and 21 days). Results were similar at 30 and 44 days (Table 2); none of the observed differences in rehospitaliza-

tion was statistically significant (Table 2). In multivariate analyses, babies in the no home visit group appeared at least twice as likely to have had no well-baby visit by 21, 44, and 74 days of age. This difference had only marginal statistical significance, however, and confidence intervals were wide (Table 3).

Discussion

This small study had important limitations, including a retrospective before-after design, limited outcome measures, and limited statistical power. For example, with rehospitalization rates and effect sizes in the range of those observed in our study, more than 1000 infants would have been needed in each study group to detect a statistically significant difference in rehospitalizations. Although more newborns in the home visit group had Medi-Cal coverage and fewer were uninsured, which could have given advantages to the home visit group independent of home visiting, adjustment for insurance confirmed the bivariate results for acute care visits and appeared to confirm the results for well-baby visits.

Even though utilization was not measured at sites other than UCSF, eligibility criteria excluded babies likely to be followed elsewhere. Further-

Table 2. Number and Percentage of Newborns with Each Outcome, by Study Group.

Study Group	No Home Visit (n = 83) No. (%)	Home Visit ' (n = 91) No. (%)	P Value	
One or more acute care visits Up to 14 days Up to 21 days Up to 30 days	23 (27.7) 25 (30.1) 31 (37.3)	15 (16.5) 22 (24.2) 37 (44.6)	0.07 0.38 0.65	
Op to 44 days One or more rehospitalizations Up to 14 days Up to 21 days Up to 30 days Up to 44 days	3 (3.6) 3 (3.6) 3 (3.6) 3 (3.6) 4 (4.8)	1 (1.1) 1 (1.1) 2 (2.2) 2 (2.2)	0.27 0.27 0.58 0.34	
No well-baby visit Up to 21 days Up to 44 days Up to 74 days	14 (16.9) 8 (9.6) 6 (7.2)	11 (12.1) 4 (4.4) 2 (2.2)	0.37 0.17 0.11	

Table 3. Adjusted Odds Ratios of Acute Care and Well-Baby Visits Among Newborns with and Without Home Visiting.

Visit Characteristics	No Home Visit*	Home Visit
Odds of one or more acute care visits (vs.pone)		
Up to 14 days Up to 21 days Up to 30 days Up to 44 days	2.30 (1.05, 5.05) [†] 1.62 (0.78, 3,34) 1.29 (0.67, 2.51) 1.28 (0.67, 2.44)	1.00 1.00 1.00 1.00
Odds of no well-baby visit (vs 1 or more) Up to 21 days Up to 44 days Up to 74 days	2.18 (0.87, 5.43) [‡] 3.54 (0.84, 14.87) [‡] 8.30 (0.91, 76.16) [‡]	1.00 1.00 1.00

Note: Adjusted for insurance (Medi-Cal, none, private); parity (first birth, other); and intention to breast-feed at time of delivery (formula only, and breast-feeding).

*Odds ratios and 95% confidence intervals.

[†]P value for difference = 0.04.

[†]*P* value for difference ≤ 0.10 .

more, local pediatric providers believe it is unlikely that utilization of care at other sites changed substantially during the study period. If the provision of home visiting in itself altered the likelihood of using non-UCSF sites, it should have affected both acute and preventive care similarly; however, although we observed fewer acute care visits in the home visit group, that group had more well-baby visits. Increasingly stringent criteria for hospitalization over time could have contributed to reduced readmissions among the home visit group; nevertheless, apparent effects on rehospitalization paralleled findings on acute care visits, making it less likely that secular trends alone explain the observed reduction in readmissions.

It is plausible that nurse home visiting could lead to fewer acute care visits and rehospitalizations by providing early recognition of and effective intervention for problems such as jaundice, feeding difficulties, and skin and cord care in the home setting. Home visit nurses drew blood for bilirubin checks and set up home phototherapy if indicated; they provided breast-feeding promotion and teaching on feeding techniques and skin and cord care. Home visit nurses discussed the schedule of well-baby visits and immunizations. The lower no-show rates we observed for wellbaby visits in the home visit group could reflect reinforcement of preventive care plans or a stronger connection with providers as a result of the home visit. Ghilarducci and McCool¹⁶ found

lower no-show rates for women's routine postpartum visits among low-income women who received a home visit after standard obstetric stays (mean stay 3.7 days) compared with others who were not visited at home.

The effect of a single visit a few days after discharge would be expected to be strongest in the period immediately following the visit and to diminish with time. While the effect of home visiting on acute care visits and rehospitalization appeared to diminish with time, the magnitude of the differences in well-baby care appeared to increase with the infant's age, which is difficult to explain. Confidence intervals were wide and overlapping, however, and the point estimates should not be overinterpreted.

Several aspects of this study suggest that our findings actually might underestimate the effects of early discharge with home visiting in this and other settings. First, privately insured patients at UCSF include many university medical center faculty and professionals; less educated populations could be more vulnerable to the effects of a short hospital stay in the absence of early support after discharge. Similarly, restricting the sample to babies with at least one visit at UCSF during the first 74 days could have eliminated patients at especially high risk without in-home follow-up, ie, underutilizers of ambulatory services, particularly those not coming for well-baby care. In addition, average newborn length of stay in the sample diminished during the study period by 6.6 hours (P < 0.01, Table 1), consistent with decreases in mean length of stay for all "well newborns" at UCSF during the study period (UCSF Hospital Administration data). Given the outcomes studied and the physiologic events occurring in the first postnatal days, it is unlikely that better outcomes in the home visit group were a result of shorter hospital stays.

Anecdotally, UCSF providers stated that they generally discharged babies even earlier than previously once routine home visiting was instituted, because of the virtually assured follow-up. Thus, because their stays were shorter, babies in the home visit group could have had more problems following discharge (related to less time for inhospital observation) than those in the no additional follow-up group. Furthermore, the home visiting group could have included more babies with problems detected before discharge than did the no home visit group, because providers were more comfortable permitting early discharge even in the presence of certain problems (eg, mild to moderate jaundice, poor feeding) when in-home professional follow-up was scheduled within 1 or 2 days. Finally, while the babies with and without home visits had mean stays around 29 and 35 hours, respectively, during the study period, average length of stay following uncomplicated vaginal birth in this region is now 24 hours or less. For each of these reasons, the results reported here could underestimate the potential problems associated with early discharge in the absence of adequate routine follow-up.

Other studies have examined outcomes associated with multiple nurse home visits after early discharge.^{4,5,7,17} These studies have had the substantial advantage of randomized designs, but have been of similar or smaller size and had more socioeconomically homogeneous study participants. This study is limited by its size and retrospective design but adds to current knowledge by examining health service use among a socioeconomically diverse population of low-risk newborns, each receiving a single nurse home visit a few days after early discharge and accompanying telephone services from the visiting nurse. As in previous studies, this one does not have the statistical power to assess effects on rehospitalization; however, a significant reduction of acute care visits was found to be associated with a single nurse home visit and telephone follow-up after early discharge.

There was no comparison group who received multiple home visits, leaving unanswered the question whether additional benefits might be observed with a stronger intervention. The effects of different components of the home visiting intervention used at UCSF—the visit itself, telephone availability following a visit, and a routine telephone call a few days after the visit—cannot be distinguished by this study. Numbers were inadequate to assess differences in effect sizes among subgroups defined by differences in socioeconomic status or social support; the results could underestimate the effects of nurse home visiting among groups more disadvantaged than the study population.

Although definitive conclusions cannot be drawn, the observed patterns suggest potential benefits associated with a single postpartum home visit accompanied by routine telephone support services for apparently low-risk mothers and newborns following routine early discharge. Well-baby visits are the primary context for infant immunizations. Even modest effects of a single visit on neonatal acute care visits or rehospitalizations or on missed well-baby visits in the general population of apparently low-risk newborns could have substantial effects on health and health care costs at the statewide or national levels given the numbers of persons involved. A rigorous study is needed of the consequences of early newborn and maternal discharge with a range of follow-up practices after discharge in diverse populations. Such a study should be randomized, should have adequate numbers for subgroup analyses looking specifically at socioeconomically vulnerable populations, and should examine effects of early discharge and accompanying follow-up practices on the well-being of women as well as infants.

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