

Outcome and Cost Analysis of Preterm Premature Rupture of Membranes in an Outpatient Setting

Dibe Martin, MD; Michael O. Gardner, MD, MPH; Karen Howell, RNC; Jose L. Gonzalez, MD; Marilyn W. Griffin, RN; and Luis B. Curet, MD

Abstract

The objective of this study was to analyze the clinical outcomes and costs of outpatient management of patients with premature preterm rupture of membranes. We reviewed maternal and neonatal records, for the period January 1992 through December 1995, of patients who were less than 37 weeks' gestation at the time of premature rupture of membranes. The records were evaluated for data on gestational age at membrane rupture and at delivery, indications of maternal infection, and complications of prematurity. Seventy-one patients with premature rupture of membranes received care on an outpatient basis. All 71 initially were admitted and received prophylaxis for group B streptococcus; those whose cultures tested positive were given antibiotics for 7 days. Four of the 71 patients had chorioamnionitis or postpartum metritis. The mean latent period from the time of premature rupture of membranes until delivery was 29.7 days; patients were admitted to the hospital for a mean of 5.9 days before delivery. The neonatal intensive care unit had 46 admissions. Neonatal complications included: sepsis, in 4.1% of those admitted; respiratory distress syndrome, in 20.5%; intraventricular hemorrhage, in 4.1%; and necrotizing enterocolitis, in 2.7%. There were two neonatal deaths, both occurring in extremely premature infants. The mean cost for outpatient management was \$11,368 per patient, compared with an estimated \$33,517 per patient for in-hospital care. Outpatient management offered a marked reduction in health-care costs without any apparent increase in the incidence of maternal or neonatal morbidity when compared to the national published data.

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Preterm birth is the largest contributor to perinatal morbidity and mortality.¹ Preterm birth may occur as a result of spontaneous preterm labor, indicated preterm delivery for maternal or fetal complications, or preterm premature rupture of membranes (PPROM).² In fact, PPRM accounts for 30% to 40% of all preterm births.³

The management of patients with PPRM remains controversial. Ninety-seven percent of respondents to a 1985 questionnaire by the Society for Perinatal Obstetricians recommended expectant management for patients with PPRM.⁴ Expectant management involves close observation without intervention towards inducing labor usually in the traditional hospital setting. However, in 1995, Cox et al⁵ reported that no clinical advantage was associated with expectant management in patients with PPRM between 30 and 34 weeks of gestation. Moreover, expectant management of patients with PPRM has been associated with cases of fetal distress as a result of infection or cord accidents. To minimize the incidence of fetal compromise, monitoring of fetuses with PPRM is recommended after the fetus has reached viability; however, little data available to support specific monitoring regimens.⁶⁻⁸

In the majority of institutions, patients presenting with PPRM are hospitalized and, after confirmation of the diagnosis, receive inpatient management.⁶ Those advocating the use of expectant inpatient management believe that hospitalization helps to reduce the incidence of infection, and that it offers a closer means of surveillance for any evidence of fetal compromise.^{8,9} To our knowledge, only one published study has compared inpatient and outpatient management in these patients.

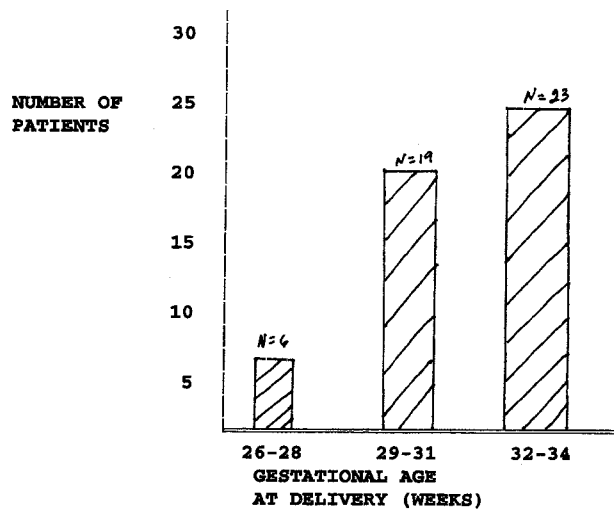
In that study, Carlan et al¹⁰ evaluated the use of outpatient management in patients with PPRM. They concluded that only a small proportion of patients could meet their criteria for outpatient management, and that the length of the latency period and gestational age at delivery were not significantly dif-

From the Division of Maternal Fetal Medicine, Department of Obstetrics and Gynecology, University of New Mexico Health Sciences Center, Albuquerque, NM.

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Address correspondence to: Dibe Martin, MD, Maternal Fetal Medicine, Department of Obstetrics and Gynecology, 2211 Lomas Blvd, NE, Albuquerque, NM 87131-5286.

Figure 1. Mean Gestational Age at Delivery ≤ 34 Weeks



ferent in those who received outpatient management and in hospitalized patients.

Outpatient management has the potential to reduce the costs of the management of PPRM significantly and may provide patients with a better quality of life by allowing them to remain in the home environment. Our purpose was to analyze the clinical outcomes and costs of management of patients with PPRM in an outpatient setting.

Table 1. Maternal and Neonatal Characteristics

PPROM Patients Managed as Outpatients	71
PPROM Patients Managed as Outpatients ≤ 34 wk	48
Mean Maternal Age (yr)	24.29 \pm 5.58
Mean Gestational Age at PPRM (wk)	30.07 \pm 4.55
Median Gestational Age at PPRM (wk)	32.0
Mean Gestational Age at Delivery (wk)	34.11 \pm 3.15
Median Gestational Age at Delivery (wk)	34.0
Mean Birthweight (gm)	2,358.078 \pm 31.702
Mean Latent Phase (d)	29.7
Mean Inhospital Days	5.9
Maternal Infection Rate (%)	5.6

PPROM = premature rupture of membranes.

... PATIENTS AND METHODS ...

We reviewed maternal and neonatal records of patients with a diagnosis of PPRM who received care at the University of New Mexico Health Sciences Center from January 1992 through December 1995. End points analyzed included gestational age at the time of membrane rupture; gestational age at delivery; maternal infections; newborn intensive care unit (NICU) admissions; and incidence of neonatal respiratory distress syndrome (RDS), necrotizing enterocolitis (NEC), intraventricular hemorrhage (IVH), and neonatal sepsis. The diagnosis of PPRM in all patients was documented by a history and positive nitrazine and ferning tests. All patients were admitted and received antimicrobial prophylaxis for group B streptococcus for 48 hours or until culture results were available. Patients whose cultures tested positive for this organism completed antimicrobial treatment for 7 days. Complete blood counts were ordered on admission, and were only repeated if there was clinical suspicion of infection.

Patients meeting the following criteria were discharged and managed in an outpatient setting: no evidence of infection, no evidence of uterine contractions for 12 hours, stable vertex presentation, access to a telephone, and availability of transportation. Criteria for exclusion from outpatient management included: nonvertex or unstable presentation, evidence of uterine contractions, or evidence of infection. Of the 494 patients whose records were examined 71 (14%) met the criteria for outpatient management of PPRM.

Outpatient management consisted of bed rest, daily temperature checks, daily nonstress tests (NSTs) administered by a visiting nurse, and weekly examination of the amniotic-fluid index. All patients were followed up in the maternal-fetal medicine clinic on a weekly basis. Patients were readmitted if evidence of maternal or fetal infection, uterine contractions, or nonreassuring fetal surveillance was observed. Three patients received corticosteroids for fetal lung maturation. No patient received tocolytics. In the absence of any contraindication, patients were observed until spontaneous labor ensued.

... RESULTS ...

During the study period, 71 patients with PPRM were managed as outpa-

tients. The mean gestational age at PPROM was 30.07 ± 4.55 weeks, and the mean latent period from PPROM until delivery was 29.7 days; patients were hospitalized for a mean of 5.9 days before delivery. Four (5.6%) patients had chorioamnionitis or postpartum metritis. One of the 71 was readmitted at 37 weeks of gestational age with an abruptio placenta in labor and delivered without further complications.

A total of 48 patients received outpatient management and were delivered at 34 weeks of gestational age or less. The mean gestational age at delivery was 34.11 ± 3.15 weeks (Figure 1), and the mean birth weight was $2,359 \pm 631.71$ grams (Table 1). Of the 73 newborns (the group included two pairs of twins), 2 died as a result of extreme prematurity. There were a total of 46 NICU admissions, accounting for 95.8% of the patients delivered at 34 weeks of gestation or less; all were the result of prematurity. The neonatal sepsis rate was 4.1%, and the rate of RDS was 20.5%. In addition, rates of 4.1% and 2.7% were observed for IVH and NEC, respectively.

The mean costs for outpatient management was \$11,368 per patient. Outpatient management fees were \$209 per patient per day. The breakdown of this figure consists of \$100 for the nurse visit, evaluation, and counseling; \$64 for the NSTs; and \$45 for the physician reading of the NST. The daily obstetric special-care-unit fee for antepartum patients was \$950; this amount includes hospital fees, nursing care, and NSTs. If patients had remained hospitalized until delivery, the estimated cost would have been a minimum of \$33,517 per patient (Table 2). The costs for weekly AFI measurements were not taken into account because they represent a constant figure in both the inpatient and the outpatient population, and therefore did not alter the cost analysis. The costs for each group were calculated for each patient individually with the quoted figures, and then the means for each group were calculated.

... DISCUSSION ...

Traditional management of PPROM involves hospitalization of the patient until delivery, with the burdens of a complicated pregnancy and social isolation.¹¹ Such management issues as timing of delivery,

Table 2. Cost-Analysis Calculations (Mean Charges)

	Outpatient Management	Inpatient Management (Estimated)
Mean Days	29.7	29.7
Nursing Fee	\$100] \$950/Day (Global Fee)
NST Fee	\$64	
Physician Fee	\$45	
Total	\$11,368/PT	\$33,517/PT

NST = nonstress test

inpatient versus outpatient management, and frequency of antepartum testing have yet to be resolved. Various authors report different testing modalities, as well as different frequencies of testing. In 1994, Nelson et al¹² reported administering twice-weekly NSTs for PPROM managed expectantly in the inpatient setting. Carlan et al¹⁰ used twice-weekly NSTs for both outpatients and inpatients who received expectant management. They concluded that neither the length of the latency period nor gestational age at delivery differed between the two groups, and that, in the strictly selected population meeting their guidelines, outpatient management appeared to be safe.

We began management of PPROM on an outpatient basis during 1992, following a hypothesis that the incidence of maternal or fetal/neonatal morbidity or mortality should be no higher in a well-selected group of outpatients than in inpatients. We chose to perform daily NST evaluations on our patients since this was the current evaluation protocol used at our institution for the inpatient management of PPROM. Evaluation of the NST for evidence of fetal tachycardia or cord compression were the main goals. Our results are comparable to nationally published rates of maternal and neonatal morbidity.¹³ In addition, we had anticipated that this type of patient management would be associated with a decrease in the cost of care. Analysis of the cost of managing our patients in an outpatient setting confirmed these expectations.

At our institution, the costs for inpatient management of antepartum patients is a global fee that is billed regardless of length of stay or diagnosis. The majority of our outpatients were covered by New Mexico Medicaid. The inpatient and outpatient charges presented in our paper were 100% reimbursed by Medicaid.

The population of patients managed at our institution is mainly a referral population from the entire state of New Mexico as well as areas of Arizona. The patients managed in the outpatient setting were the

patients that met our medical and geographical requirements. Some of the patients that would have been candidates for outpatient management had to be managed in the inpatient setting solely because of their geographical reasons. Also, follow-up of the 423 total patients managed in the inpatient setting was not possible because some of them returned to their referring physician once that physician felt comfortable with the patient's gestational age.

We did not conduct a formal quality-of-life assessment of our patients, and this area is an important one for future study by other researchers. Nevertheless, both patients and nursing staff have responded to the program of outpatient management with enthusiasm.

Our data suggest that, in selected patients, outpatient management of PPRM may be a safe treatment modality. Prospective clinical trials should be undertaken to further evaluate and establish in a larger patient population the adequate management strategy for patients with PPRM who receive care in an outpatient setting. In conclusion, outpatient management of patients with PPRM may yield a marked reduction in healthcare costs with no apparent increase in the incidence of maternal and neonatal morbidity.

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