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Do All Hospitals Need Cesarean Delivery Capability?
An Outcomes Study of Maternity Care in a Rural Hospital Without On-Site Cesarean Capability

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■ OBJECTIVES We analyzed perinatal outcomes at a rural hospital without cesarean delivery capability.

■ STUDY DESIGN This was a historical cohort outcomes study.

■ POPULATION The study population included all pregnant women at 20 weeks or greater of gestational age (n = 1132) over a 5-year period in a predominantly Native American region of northwestern New Mexico.

■ OUTCOMES MEASURED The outcomes studied included perinatal mortality, neonatal morbidity, obstetric emergencies, intrapartum and antepartum transfers, and cesarean delivery rate. We did a detailed case review of all obstetric emergencies and low-Apgar-score births at Zuni-Ramah Hospital and all cesarean deliveries for fetal distress at referral hospitals.

■ RESULTS Of the 1132 women in the study population, 64.7% (n = 735) were able to give birth at the hospital without operative facilities; 25.6% (n = 290) were transferred before labor; and 9.5% (n = 107) were transferred during labor. The perinatal mortality rate of 11.4 per 1000 (95% confidence interval, 5.1-17.8) was similar to the nationwide rate of 12.8 per 1000 even though Zuni-Ramah has a high-risk obstetric population. No instances of major neonatal or maternal morbidity caused by lack of surgical facilities occurred. The cesarean delivery rate of 7.3% was significantly lower than the nationwide rate of 20.7% ($P < .001$). The incidence of neonates with low Apgar scores (0.54%) was significantly lower than the nationwide rate (1.4%). The incidence of neonates requiring resuscitation (3.4%) was comparable to the nationwide rate (2.9%).

■ CONCLUSIONS The presence of a rural maternity care unit without surgical facilities can safely allow a high proportion of women to give birth closer to their communities. This study demonstrated a low level of perinatal risk. Most transfers were made for induction or augmentation of labor. Rural hospitals that do not have cesarean delivery capability but are part of an integrated perinatal system can safely offer obstetric services by using appropriate antepartum and intrapartum screening criteria for obstetric risk.
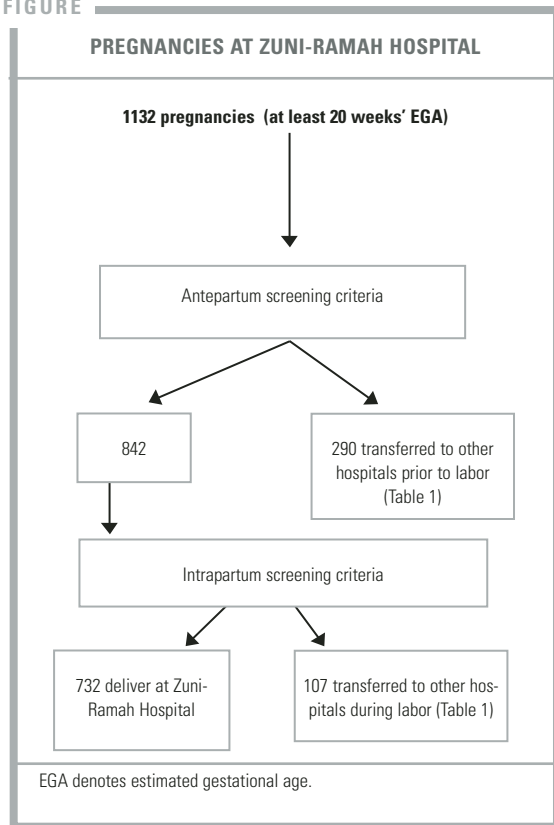
■ KEY WORDS Cesarean section; maternal health services; obstetrics; pregnancy outcome; rural hospitals. *(J Fam Pract 2002; 51:129-134)*

KEY POINTS FOR CLINICIANS

- Rural hospitals without cesarean delivery capability can safely offer obstetric care to selected patients as part of an integrated perinatal network.
- Measures of maternal and neonatal morbidity and mortality were at or below national averages despite a higher-risk population.
- Antepartum (25.6%) or intrapartum (9.5%) transfer to hospitals with surgical or tertiary-care facilities was required for 35% of pregnant women.
- The use of oxytocin induction or augmentation, if determined safe, may significantly lower the transfer rate from rural hospitals that lack cesarean delivery capability.

The availability of perinatal care in rural communities produces better pregnancy outcomes than do perinatal systems that require rural women to seek maternity care in distant urban areas.[1-3] Unfortunately, rural maternity care has been affected by the loss of physicians who offer these services and by the closing of many rural hospitals' maternity care units. Maintaining 24-hour operative obstetric capabilities is difficult in rural areas because they have an insufficient population base to support a

PREGNANCIES AT ZUNI-RAMAH HOSPITAL

1132 pregnancies (at least 20 weeks' EGA)

Antepartum screening criteria

842

290 transferred to other hospitals prior to labor (Table 1)

Intrapartum screening criteria

732 deliver at Zuni-Ramah Hospital

107 transferred to other hospitals during labor (Table 1)

EGA denotes estimated gestational age.

physician trained in operative obstetrics. Another barrier is the lack of anesthesia services and operating room personnel.

The Guidelines for Perinatal Care developed by the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics (AAP) state, "All hospitals offering labor and delivery services should be equipped to perform emergency cesarean delivery." [4] Nevertheless, not all rural obstetric units can offer cesarean delivery and must transfer patients to a referral hospital for operative needs. Advisory panels in the United States and Canada have recommended similar models of rural perinatal care.[5-8] A Canadian panel estimated that 125 Canadian hospitals offer obstetric care without surgical facilities.

Studies of rural hospitals in Canada, Australia, and the United Kingdom that lack continuous on-site cesarean capability are limited by the small number of deliveries.[9-12] Most such studies are hospital based rather than population based and lack data on women who are transferred to outlying hospitals. The only population-based study that we identified found no evidence of adverse events caused by the lack of cesarean facilities; the sample size, however, was limited to 286 births.[9]

We studied all pregnancies occurring in a pre-

dominantly Native American region of New Mexico over a 5-year period to ascertain the safety of rural perinatal care based in a hospital without cesarean capability. Population-based and hospital-based outcomes are presented. This is the first study from a US community using this model of care.

METHODS

We conducted an outcomes study using a historical cohort study design of all pregnancies beyond 20 weeks of gestation in the Zuni Pueblo and Ramah Navajo communities of northwestern New Mexico from 1992 to 1996. The perinatal services based at the Zuni-Ramah Indian Health Service (IHS) Hospital are the focus of this study. This 37-bed community hospital, staffed by family physicians and a part-time nurse-midwife, is part of an integrated perinatal system. The birthing unit has access to obstetrician-gynecologist (OBG) consultants at the Gallup Indian Medical Center (GIMC), 33 miles to the north, and perinatology and neonatology care in Albuquerque, 147 miles to the east. GIMC, the primary referral hospital and closest surgical facility, has an obstetric unit staffed by OBGs, family physicians, and nurse-midwives. Transportation time is 40 minutes by ground ambulance to GIMC or by fixed wing aircraft to Albuquerque.

The Zuni-Ramah Hospital limits intrapartum care to women designated as at low or moderate risk by criteria established by Zuni-Ramah family physicians and reviewed by GIMC OBGs. Criteria mandating transfer included prior cesarean, malpresentation, multiple gestation, intrauterine growth restriction, severe preeclampsia, placenta previa, significant vaginal bleeding, major fetal anomalies, anticipated preterm delivery (< 36 weeks), nonreassuring fetal heart tones (NRFHTs), and need for labor induction or augmentation with oxytocin. Women with gestational or type 2 diabetes who were well controlled could give birth at Zuni-Ramah unless they had end-organ damage or the fetus had known macrosomia. Physicians successfully completed the Advanced Life Support in Obstetrics (ALSO, ®American Academy of Family Physicians, 4th ed., 2000) course, attended weekly high-risk obstetric rounds, and performed quarterly reviews of obstetric complications. The family physicians performed vacuum-assisted deliveries, utilized amnioinfusion, and used continuous or intermittent fetal monitoring.

A review of the delivery and transfer records of the Zuni-Ramah Hospital and GIMC obstetric services revealed that there had been 1132 births of 1137 infants during the study period. The authors used a data collection form to review prenatal and newborn

TABLE 1

ANTEPARTUM AND INTRAPARTUM TRANSFERS FROM ZUNI-RAMAH HOSPITAL

Indication	Number of Transfers (%)
Antepartum Transfers*	
Preeclampsia	83 (28.6)
Prior cesarean delivery	55 (19.0)
Nonreassuring testing	39 (13.4)
Preterm (includes PPROM)	24 (8.3)
Diabetes	22 (7.6)
Postdates	21 (7.2)
Other	18 (6.2)
Malpresentation	16 (5.5)
Chronic HTN	8 (2.8)
Macrosomia	7 (2.4)
IUFD	6 (2.1)
IUGR	5 (1.7)
Anomalies	4 (1.4)
Total	**290 (25.6% of population)**
Intrapartum Transfers	
First-stage arrest of labor	37 (34.6)
PROM without active labor	32 (29.9)
Malpresentation	9 (8.4)
Fetal distress	5 (4.7)
Nonreassuring tracing	12 (11.2)
Other	12 (11.2)
Total	**107 (9.5% of population)**

*Greater than 290 because of 18 patients with 2 reasons for antepartum transfer.

HTN denotes hypertension; IUFD, intrauterine fetal demise; IUGR, intrauterine growth restriction; PROM, premature rupture of membranes; PPROM, preterm premature rupture of membranes.

records from every birth. We reviewed intrapartum records for all births at the Zuni-Ramah and GIMC hospitals. We obtained discharge summaries from tertiary-care sites. We interviewed perinatal coordinators, public health nurses, and pediatric care providers to obtain information about patients who had received perinatal care outside of the IHS system.

The outcomes measured included perinatal mortality, neonatal morbidity, obstetric emergencies, intrapartum and antepartum transfers, and cesarean delivery rate. All obstetric emergencies originating at Zuni-Ramah Hospital were reviewed to determine whether the lack of surgical facilities had resulted in adverse outcomes. The physician's notes were used to differentiate a NRFHT pattern requiring observation at a hospital with operative facilities from a truly worrisome pattern that required urgent intervention for fetal distress.

Births were defined as deliveries of infants at 20 weeks or more of estimated gestational age. We analyzed each birth in a multiple gestation individually. The population-based perinatal mortality rate was calculated from 20 weeks' estimated gestational age

to the 28th neonatal day. The Zuni-Ramah Hospital perinatal mortality rate was calculated by inclusion of all women delivered at Zuni-Ramah Hospital or transferred during labor. Approval for the study was obtained from the IHS Institutional Review Board and the Zuni Tribal Council.

RESULTS

Study Population

We identified 1137 births to 945 women between 1992 and 1996. Zuni and Navajo births were 66.9% and 30.8%, respectively; 30% of women were primiparous and 70%, multiparous. We found that 10.4% of births had occurred in women older than 35 years and 7.8% in women younger than 18 years. Regarding prenatal care, 3.9% of women had received none; 43.0% had established prenatal care in the first trimester; 40.4%, in the second trimester; and 12.8%, in the third trimester.

Delivery Sites and Maternal Transfers

The majority of women (64.4%, n = 732) gave birth at the Zuni-Ramah Hospital (Figure) or at GIMC (29.6%, n = 337). A small number (2.2%, n = 25) gave birth at a private hospital with surgical facilities in Gallup. Albuquerque tertiary-care hospitals were the sites of 3.2% (n = 36) of deliveries. Primary indications for tertiary care were prematurity and fetal anomalies. Seven (0.6%) deliveries occurred at other sites, including home and ambulance.

The antepartum transfers (Table 1) were required primarily for pregnancy complications requiring labor induction. Preeclampsia, diabetes, nonreassuring antepartum testing, and post dates patients accounted for 56.8% of the 290 transfers. The 107 intrapartum transfers were made predominantly for labor induction or augmentation (64.5%, n = 69), a concerning fetal heart tracing (15.9%, n = 17), or fetal malpresentation diagnosed during labor (8.4%, n = 9).

Obstetric Interventions

The total cesarean delivery rate (7.3%) was approximately one third the nationwide rate of 20.7% in 1996. The primary cesarean delivery rate (number of cesareans in women without prior cesarean divided by the number of women who have never had a cesarean) of 5.3% compares with a nationwide primary rate of 14.6%. The cesarean rate was 22.1% for antepartum transfers and 17.8% for intrapartum transfers. Operative vaginal delivery occurred in 5.4% of births, well below the nationwide rate of 9.4%. The induction rate of 13.8% is lower than the nationwide rate of 16.9%. The oxytocin augmentation rate of 7.7% is well below the nationwide rate

of 16.9% in 1996.[13] Parenteral narcotics were available at Zuni-Ramah; however, 81.4% of women elected to receive no labor analgesia. Epidural anesthesia was not available at Zuni-Ramah Hospital.

Perinatal Mortality

The perinatal mortality rate for the population was 11.4 per 1000 births (95% CI, 5.1-17.8 by Poisson distribution), comparable to the 1991 nationwide perinatal mortality rate of 12.8/1000.[14] Nine of the 13 neonatal deaths were caused by intrauterine fetal demise before labor (Table 2). The Zuni-Ramah Hospital–based perinatal mortality rate of 1.2/1000 was comparable with the 1.3/1000 perinatal mortality rate for women in the National Birth Center study even though Zuni-Ramah Hospital accepts higher-risk patients.[15]

Neonatal Morbidity

Measures of neonatal morbidity are summarized in Table 3. The frequency of 5-minute Apgar scores below 7, low birthweight, and prematurity compares favorably with 1996 US rates.[13] The rate of assisted ventilation (intubation or bag-mask) for the entire population (4.6%, n = 52) is greater than the 1996 nationwide rate (2.9%), although the difference is of questionable clinical significance, since international studies have demonstrated a range for assisted ventilation of 1% to 10% of hospital births.[16] Neonatal Intensive Care Unit (NICU) transfer occurred in 27 (2.4%) of deliveries from non-tertiary-care sites. Thirteen (1.8%) babies born at Zuni-Ramah were transferred to Albuquerque for NICU care because of respiratory distress (n = 10) or neonatal anomalies (n = 3). The 3 cases of low Apgar scores at Zuni-Ramah were attributed to pneumothorax, respiratory distress syndrome of prematurity, and sepsis with meconium aspiration.

Obstetric Risk Factors

The study population had a greater incidence of pregnancy-induced hypertension (14.5% vs 2.6% by 1996 ACOG criteria[17]), chronic hypertension (2.7% vs 0.7%[15]), and diabetes (9.2% vs 2.6%[15]) than the average US obstetric population. Gestational diabetes was diagnosed according to National Diabetes Data Group criteria:[18] 7.1% had gestational diabetes (class A_1 and A_2) and 2.1% had type 2 antepartum diabetes (classes B and C).

Outcomes of Obstetric Emergencies at Zuni-Ramah Hospital

We reviewed all cases of placental abruption, uterine inversion, umbilical cord prolapse, and fetal distress at Zuni-Ramah Hospital to identify potentially preventable adverse outcomes caused by lack of operative facilities (Table W1 at http://www.jfponline.com). Umbilical cord prolapse and uterine inversion each occurred once and were appropriately managed, with excellent outcomes. In 3 of the 4 cases of placental abruption, there were clearly no adverse outcomes caused by lack of on-site operative facilities, as patients were expectantly managed upon arrival to the referral hospital (cases 3 and 4) or presented to Zuni-Ramah Hospital as an intrauterine demise (case 5).

The fourth patient with placental abruption (case 6) presented at Zuni-Ramah with vaginal bleeding, severe variable decelerations, and a 10-point drop from baseline hematocrit. She was scheduled to labor at GIMC because of a history of prior cesarean but presented to the Zuni-Ramah emergency room with vaginal bleeding. She was transferred to GIMC for an anticipated cesarean delivery; however, on arrival the patient rap-

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TABLE 2

PERINATAL MORTALITY IN ZUNI-RAMAH POPULATION

Age (wk)	Weight (g)	Site	Cause
Intrauterine Fetal Death			
31	1410	GIMC	Unexplained
39	3130	GIMC	Unexplained
35	1540	GIMC	Unexplained; IUGR
35	1690	GIMC	Unexplained; IUGR
21	330	GIMC	PPROM
21	560	GIMC	PPROM
41	3040	GIMC	Oligohydramnios and post dates. Two days prior, refused induction with amniotic fluid volume index of 3.8
28	1290	Alb	Abruption
32	Unknown	Zuni	Necrotizing/calcifying encephalopathy (probable CMV) with severe IUGR
Early Neonatal Death (< 7 days)			
38	2805	Alb	Osteogenesis imperfecta
31	Unknown	Alb	Potter's syndrome
Late Neonatal Death (7 to 27 days)			
35	1590	GIMC	Pulmonary interstitial emphysema caused by respiratory failure of unknown etiology/IUGR
41	3220	GIMC	Sepsis at 12 days; had been discharged home as healthy infant

Alb denotes Albuquerque tertiary-care hospital; CMV, cytomegalovirus; GIMC, Gallup Indian Medical Center; IUGR, intrauterine growth restriction; PPROM, preterm premature rupture of membranes.

NEONATAL MORBIDITY IN ZUNI-RAMAH POPULATION, BASED ON LIVE BIRTHS

	Zuni-Ramah Hospital (N = 732)	Zuni-Ramah Population (n = 1128)	1996 US Population
5-minute Apgar score < 7	3 (0.41%), P = .023	6 (0.54%), P = .014	1.4%
Assisted ventilation	19 (2.6%), P = 0.62	52 (4.6%), P < .001	2.9%
Birthweight < 2500 g	14 (1.9%), P < .001	61 (5.4%), P < .001	11%
Preterm (37 weeks)	22 (3.0%), P < .001	75 (6.7%), P = .36	7.4%

P values are based on comparison with the US population. US population figures for 1996 were extracted from Ventura SJ, Martin JA, Curtin SC, Mathews TJ. Report of Final Natality Statistics, 1996. Monthly vital statistics report; vol 46, no 11, supp. Hyattsville, Md: National Center for Health Statistics, 1998.

idly progressed and gave birth to an infant vaginally with Apgar scores of 3 and 9. Her infant had a neonatal seizure and magnetic resonance imaging evidence of sagittal sinus thrombosis. The infant had a normal neurologic evaluation, developmental assessment, and electroencephalogram at 15 months.

We reviewed 5 cases of urgent transfer for fetal distress. These were differentiated from the 8 intrapartum transfers for NRFHTs based on the severity of fetal heart monitor tracings. Four of the 5 women who had been transferred for fetal distress gave birth to healthy infants vaginally more than 2 hours after arrival at the referral institution. One patient who was urgently transferred for repetitive late decelerations is discussed below.

Cesarean Deliveries for Fetal Distress at Referral Hospitals

We reviewed all cases of cesarean deliveries for fetal distress (n = 10) at referral institutions to determine whether outcomes for any of the patients could potentially have been improved by having their cesarean deliveries earlier if operative facilities had been available at Zuni-Ramah Hospital or by being transferred earlier (Table W1 at http://www. jfponline.com). Seven of the 10 patients were transferred for preeclampsia, NRFHTs, or failure to progress. All had their cesareans for fetal distress many hours after arrival at the referral institution.

Two cases of cesarean delivery for fetal distress after transfer because of abruption were previously described. A patient presented in early labor with repetitive late decelerations and was urgently transferred to GIMC, where she underwent an immediate cesarean delivery. Her infant had Apgar scores of 1 and 7, an unremarkable neonatal course, and a normal 15-month developmental screen.

DISCUSSION

Our outcomes demonstrate that with the use of appropriate screening criteria, childbirth can safely occur in institutions that lack surgical suites. The population-based perinatal mortality rate was similar to the nationwide rate. A review of obstetric emergencies and low Apgar scores among the 839 women laboring at Zuni-Ramah Hospital failed to identify adverse outcomes that might have been prevented if the hospital had had operative facilities. Cesarean rates were approximately one third the nationwide rate even though Zuni-Ramah patients had a higher prevalence of such risk factors as diabetes and preeclampsia.

Although they represented a high-risk obstetric population, 65% of women were able to give birth at Zuni-Ramah Hospital through use of the perinatal screening criteria. The 35% rate of transfer was caused largely by the need for oxytocin augmentation or induction. Only 21.6% of the women who were transferred for dysfunctional labor or premature rupture of membranes ultimately had a cesarean delivery. Oxytocin has not been permitted at Zuni-Ramah Hospital because of the ACOG guideline permitting oxytocin use only if "a physician capable of performing a cesarean delivery is readily available."[19] There are no studies addressing the safety of labor induction or augmentation without on-site cesarean capability.

Canadian guidelines for rural maternity care do not prohibit the use of prostaglandins or oxytocin at hospitals without operative facilities. A Consensus Conference on Obstetric Services in Rural or Remote Communities addressed the issue of labor induction or augmentation in hospitals without cesarean capability by stating, "If caring for a woman in labour is appropriate in the community, then caring for her during an augmented/induced labour is equally appropriate when there is support by trained local staff and resources."[20] We concur that use of oxytocin in rural hospital units without operative facilities should be considered under well-defined clinical guidelines or research protocols.

Limitations

Our study's limitations include lack of long-term neonatal outcomes, small size of the Zuni-Ramah population, an almost exclusively Native American population, and lack of examiner blinding during record review. Transfer rates may be increased in populations with higher rates of cesarean delivery or epidural anesthesia use. Alternatively, the high inci-

dence of preeclampsia, chronic hypertension, and diabetes in these communities may have resulted in a higher proportion of induction. Umbilical cord prolapse and significant placental abruption are routinely treated by urgent cesarean delivery; therefore, obstetric literature on outcomes without immediate operative intervention is limited.[21,22] A larger study would be required to determine the potential increased neonatal morbidity or mortality resulting from delayed intervention.

CONCLUSIONS

The ACOG/AAP guideline requiring on-site surgical facilities and the ability to initiate a cesarean in 30 minutes is not based on evidence. Four small retrospective studies of emergency cesarean deliveries delayed for more than 30 minutes did not demonstrate adverse neonatal outcomes.[23-26] In our study population, no adverse outcomes (none in 839 births) were determined to have been caused by a lack of surgical facilities. Despite these excellent outcomes, the possibility always exists for outcomes that can be prevented by doing a rapid emergent cesarean delivery. Women deciding to give birth in facilities without operative capabilities should receive information regarding the risks and benefits of delivering there and should have access to other facilities. Provider discretion and patient choice must be respected to ensure community support of these birthing units. Practitioners at the rural units must have assurance that any patients who require an urgent transfer will be readily accepted.

Rural communities, medical providers, and health care facilities need to consider the overall effect of maintaining local maternity care units, as the loss of rural maternity care can increase the risk of adverse perinatal outcomes.[1-3] We concur with the Canadian panel that although maintenance of rural surgical and anesthesia capabilities is desirable, "good outcomes can be sustained within an integrated risk management system without local access to operative delivery."[8] Guidelines should be developed to permit rural hospitals without cesarean capability to provide maternity care as part of integrated perinatal systems with well-developed transport protocols and supportive referral institutions. Women living in rural areas should have the option to give birth near their homes in such units if they so desire.

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