Clinical Obstetric Outcomes Related to Continuity in Prenatal Care

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Background: **Continuity of care has long been considered a benefit to patients of family physicians, but quantifying these benefits has been problematic. Previous studies focused on patient preferences and relationship issues, whereas evidence regarding clinical endpoints has been lacking. This study reports differences in obstetric and neonatal outcomes related to continuity in prenatal care.**

Methods: **Using an historical prospective design, data were collected on 494 maternal-fetal dyads in two groups. One (named GAP, n = 40) received a high degree of continuity in their prenatal care, and one (named NHC, n = 454) received relatively little. Analyses were performed to determine not only the outcome differences between the groups, but also to what factor(s) these differences were attributable.**

Results: **The continuity in prenatal care group had better outcomes in neonatal morbidity, birth weight, maternal weight gain, and both Apgar scores. None of these differences was directly attributable to continuity. Rather, continuity in prenatal care was associated with the observed increase in the number of prenatal visits, which in turn was shown to be a significant factor in the greater birth weights and maternal weight gain. None of the factors examined appears to explain the difference in neonatal morbidity.**

Conclusions: **Women who receive prenatal care from a single physician are likely to receive more prenatal care, which is correlated with greater maternal weight gains and greater fetal birth weights.**
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Since the inception of the specialty, continuity of care has been considered one of the cornerstones of family practice.[1] It has been called the Holy Grail[2] of generalist practice. Regrettably, whereas the advantages of such continuity seem obvious, there is scant research evidence showing hard number benefit in the outcomes of patients who have received continuity of care.

The published research has focused on (and shown benefits with) chronic illnesses[3] and used such end points as patients' satisfaction, number of hospital readmissions, and length of hospital stay.[4] Children who have received more continuous care have been found to be more likely to receive age-appropriate preventive measures, but not decreased morbidity or mortality.[5] It has also been shown that those who do not receive continuity of care have an increased number of relationship problems with their provider and are more likely to miss appointments.[6,7]

In regard to prenatal care, continuity has again been shown to be associated with increased satisfaction of patients[8] as well as providers.[9] In their description of the quality of prenatal care delivered in the Maternal and Child Health Centers in Jordan, Al-Qutob et al[10] considered continuity in prenatal care an integral component of high-quality prenatal care and hypothesized that continuity would result in an increased amount of prenatal care received. A small, prospective study of prenatal continuity has been reported,[11] but pregnancy complications rather than neonatal measures were used as the end points. There were studies in which continuity was maintained within a group, and the focus was on whether the group providing the prenatal care also performed the delivery.[12,13] These studies did not approach continuity from the perspective of an individual provider. A single, retrospective, cohort study[14] was found that correlated continuity with neonatal outcomes and reported an

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increase in birth weight associated with greater continuity. Most recently, a Cochrane Database review[15] examined all the above and concluded that although studies of continuity of care did show beneficial effects, it was unable to separate continuity effects from those attributable to differences between providers.

The probable reason for this dearth of evidence is the intrinsic difficulty associated with such a study. The multiplicity of independent or interrelated variables associated with a study of continuity in prenatal care is daunting. Ethnicity, socioeconomic conditions, variation in provider routines, differences in prenatal morbidities, and interventions are only some of the factors that would obscure the measurement of any continuity of care effect. These factors could be minimized (although not eliminated) only by finding two closely related groups receiving identical care with the exception of one group receiving it with and the second without a high degree of physician continuity.

In the mid-1990s such a situation developed in Fort Wayne, Indiana. The city has long been served by the Neighborhood Health Clinics (NHC), a federally funded clinic providing obstetric care to a largely Medicaid-insured population. The family practice residents of the Fort Wayne Medical Education Program provide the obstetric care in a classic clinic format, at the clinic's site, to NHC patients. Residents are assigned to the Neighborhood Health Clinics by monthly rotation. What was new in the mid-1990s, however, was the advent of a state grant made to the program aimed at those patients who did not qualify for Medicaid because of income but who still fell far short of being able to afford private obstetric care. These patients were labeled GAP patients because they were viewed as falling in the gap between Medicaid and private obstetric care. These patients were seen in the residency office as part of the resident's individual panel.

After the onset of the GAP Program, it was recognized that these two groups represented a possibly unique opportunity to study the benefits of continuity of care. These two groups of patients—judged to be closely aligned socioeconomically, treated under the same protocols, by the same group of residents, giving birth at the same hospitals—had one primary difference in their care: one group would rarely see the same physician twice, and the other would rarely see any physician other than their personal physician. It was this realization that formed the basis of our study.

Methods

The ability to find two closely related cohorts after the fact and analyze their subsequent obstetric outcomes pointed us to a design known as an historical prospective trial.[16] In this case, the intervention was essentially an insurance decision in which one group qualified for Medicaid and another group qualified for the GAP Program. This decision forced the single change in the care that these patients would receive. The patients at the Neighborhood Health Clinics received their care from residents in a clinic format, whereas the GAP Program patients were treated as continuity patients. The investigators collected data during the 3-year period after the start of the GAP Program. These patients were compared with all patients being cared for by the Neighborhood Health Clinics during the same period. The 3-year interval was considered to be the minimal amount of time needed to obtain enough participants likely to provide adequate power to the study.

We decided to evaluate a total of 27 separate variables (Table 1) for each maternal-fetal dyad. We recognized that, although some of these variables could be classified with certainty as dependent and others as independent, there would be several variables that could be considered either dependent or independent. Only after analysis of the data would we be able to speculate whether variations in these factors were the result of or the cause of the other differences noted. Continuity in prenatal care was established by denoting the physician who performed the initial obstetric history and physical examination as the patient's primary physician and by calculating the percentage of subsequent prenatal care provided by that physician.

For each dyad, all data points were abstracted from the charts after delivery. These results were obtained from three separate charts (mother-office, mother-hospital, infant-hospital) for each pregnancy. Of the more than 700 pregnancies initially examined, many were eliminated because some part of their prenatal care occurred outside one of the two study programs, or they were lost to follow-up before delivery of the infant. In addition, a patient would be excluded from the high-continuity group if the primary physician was not the delivering

Table 1. Variables Examined.

Number of prenatal visits
Percentage of visits by primary physician (continuity of care)
Smoking
Alcohol or drug use
Parity
Age
Education
Estimated gestational age at first visit
Induction or augmentation
Marital status
Father or surrogate present
Race
Preexisting medical diagnoses
Prepregnancy weight
Prenatal interventions
Prenatal complications
Maternal weight gain
Hospital of delivery
Preterm births
Operative births
Apgar scores
Length of stay
Maternal morbidity
Neonatal morbidity
Neonatal intensive care unit admissions
Birth weight
Breast-feeding

physician. A total of 494 patients were deemed appropriate for one of the two arms of this study. A total of 21 patients from the two groups, however, were excluded from further study because the pregnancies resulted in spontaneous abortions or stillbirths. The rate of these nonviable births did not differ between the two groups. Forty patients remained in the GAP group receiving continuity care, and 433 patients received episodic care through the Neighborhood Health Clinics.

Results

A test for equality of variances was performed on each variable examined, because the two groups included discrepant numbers of patients. For those variables that had significantly different variances, *t* tests not assuming equal variances were performed. Differences between the GAP and Neighborhood Health Clinics groups were observed, as shown in Table 2. As expected by the research design, the GAP group received a high degree of continuity, with a mean of about 87% of their obstetric visits performed by their primary physician. The clinic group had little continuity, with a mean of only about 18% of their obstetric visits performed by their primary physician. When controlling for type I error as a result of the calculation of multiple statistical tests (ie, family-wise error), the two groups studied differed significantly ($P \leq .05$) in the total number of prenatal visits, estimated gestational age at the time prenatal care was first sought, and term parity. Term parity refers to the number of previous full-term deliveries. The GAP group had about 3.5 more obstetric visits, on average, than the clinic group. Additionally, the GAP patient group tended to seek obstetric care about 1

Table 2. Demographic, Treatment, and Outcome Variables Differing Significantly ($P < .05$) Between Groups.

Variable	Clinic Patients Mean (SD)	GAP Patients Mean (SD)	*t(df)*	*P*
Visits by primary care physician (continuity of care) (%)	.18 (0.15)	.87 (0.13)	28.84 (471)	<.001
Prenatal visits (No.)	9.28 (4.00)	12.83 (3.48)	5.42 (471)	<.001
Education (years)	10.90 (1.93)	11.85 (1.75)	2.44 (439)	.015
Estimated gestational age at first visit (weeks)	17.18 (8.83)	12.33 (4.59)	5.78 (69.49)*	<.001
Parity (No.)	1.29 (1.48)	.75 (1.03)	2.26 (471)	.024
Term parity	1.15 (1.33)	.60 (.81)	3.84 (60.65)*	<.001
Neonatal morbidity entries (No.)	.50 (0.88)	.25 (0.44)	2.99 (71.70)*	<.004
Birth weight (kg)	3.037 (0.90)	3.340 (0.43)	3.80 (74.23)*	<.001
Maternal weight gain (lb)	20.86 (13.91)	28.18 (12.85)	3.21 (492)	<.001
Apgar at 1 minute	7.25 (2.35)	8.18 (1.18)	4.03 (70.26)*	<.001
Apgar at 5 minutes	8.33 (2.07)	8.98 (.42)	5.44 (271.89)*	<.001

Note: Parity and education drop below threshold after calculation of family-wise error.
*Equal variances not assumed, Levene test for equality of variances significant ($P < .01$), *t* test for unequal variances reported.

Table 3. Multivariate Analysis of Covariance: The Relation Between Outcomes and Treatment Variables When Statistically Controlling Confounding Variables.

Effect	Wilks Lambda*	F	P
Intercept (regression constant)	.276	304.82	<.001
Number of prenatal visits	.866	17.90	<.001
Estimated gestational age at first visit	.899	13.10	<.001
Term parity	.931	8.59	<.001
Continuity of care group	.991	1.03	.392

*All Wilks lambda statistics were computed with *df* = 4,464.

month earlier than the clinic patient group and was less likely to have carried a previous pregnancy to term.

Outcome differences were also noted. Specifically, there were significant differences in the 1-minute and 5-minute Apgar scores. The birth weights and maternal weight gains were greater in the group receiving continuity. Although each occurrence of maternal morbidity (hemorrhage, fever, prolapse, etc) or neonatal morbidity (malformation, fever, jaundice, etc) was individually cataloged, the base rate of each specific event was too low to analyze reliably. It was decided, therefore, to aggregate these occurrences under the aforementioned group headings. No significant difference in maternal morbidity between the two groups was found. There were, however, significantly more neonatal morbidity entries for the clinic group.

Because the investigators believed that the demographic and treatment variables were likely related to the outcome measures, further analyses of group differences were conducted using the number of prenatal visits, term parity, and the estimated gestational age at first visit as covariates. Multivariate analysis of covariance allowed (by holding constant) the statistical control of the demographic and treatment variables that were related to the dependent measures. Thus the analysis removed the systematic bias attributable to the remaining demographic and treatment variables.

As shown in Table 3, when statistically controlling for number of prenatal visits, estimated gestational age at first visit, and term parity, the differences between the high- and low-continuity groups disappeared. These results indicate that the differences between outcome measures are associated solely with the number of visits, term parity and estimated gestational age at first visit and are not associated with continuity of care. A regression analysis was performed to determine the amount of variation in the outcome variables attributable to each of the remaining treatment and demographic variables (Table 4). Interestingly, none of the variables considered adequately explain the variation noted in neonatal morbidity.

As stated previously, we recognize that there were variables in this study that had the possibility of being either dependent or independent. The possibility that the continuity of care variable might be working indirectly by means of the number of prenatal visits was entertained. Logically, if continuity of care were to have such a secondary effect, it should be seen only with the number of prenatal visits, because there would not appear to be a reason for a factor introduced after the first visit, such as continuity, to affect such factors as term parity or estimated gestational age at first visit. Although it would seem that only the number of prenatal visits had the possibility of being a dependent variable, it

Table 4. Proportion of Variation in Outcome Variables Predicted by the Demographic Variables.

	Predictor Variables				
	Standardized Regression Coefficients (B)				
Dependent Variables	Number of Prenatal Visits	Estimated Gestation Age at First Visit	Number of Pregnancies to Term	R^2	F(*df*)
Birth weight	.39	.21	Not significant	.096	24.94 (2,469)
Number of neonatal morbidity entries	Not significant	Not significant	Not significant	—	—
Maternal weight gain	.29	−.26	−.19	.325	74.95 (3,468)
Apgar 1 minute	Not significant	Not significant	.12	.013	6.36 (1,470)
Apgar 5 minute	Not significant	Not significant	.12	.012	5.59 (1,470)

was decided to test for association between continuity and each of the remaining demographic-treatment variables. If a significant correlation was found between continuity and number of prenatal visits, and only between these two, we could be confident that the association makes sense.

This association is indeed what was found. When controlling for estimated gestational age at first visit and term parity, there was a high degree of correlation between continuity of care and number of prenatal visits (partial correlation coefficient 0.18, $P < .001$). There was no correlation between continuity and estimated gestational age at first visit when controlling for term parity and number of visits (partial correlation coefficient -.003; $P =$. 941) or between continuity and term parity when controlling for number of visits and estimated gestational age at first visit (partial correlation coefficient -.07; $P =$. 125).

Discussion

Two groups of patients were cared for by the same physicians, used the same protocols, and gave birth at the same hospitals, with the primary difference between them being that one group received a high degree of continuity of prenatal care and the other received little such continuity. These two groups showed several differences in obstetric outcomes. Although these differences were such as to benefit the continuity group, they could not be directly attributed to continuity of care. Rather, the factors to which these benefits could be attributed were (1) the amount of prenatal care that was provided to the mother, (2) when in her pregnancy the mother first sought care, and (3) whether she had previously carried a baby to term. We were, however, able to confirm a secondary effect of continuity – specifically, we were able to relate the increased amount of prenatal care received by the continuity group to increased continuity. In this association our findings support the previously discussed hypothesis of Al-Qutob et al.[10]

Our findings also show that previous speculation on the feasibility of decreasing the number of prenatal visits recommended by the American College of Obstetricians and Gynecologists[17] would not appear viable for a higher risk group of women such as those analyzed by this study. Again, some of the outcome benefits observed between these groups should be attributed to the greater number of prenatal visits performed in the group that was found to do better. The increased number of visits was in excess of what would be expected from the earlier gestational age at first visit observed in the continuity group.

The limitations of this study are apparent. Because this study is a correlational design, one cannot legitimately infer a causal relation between the continuity variable and outcome measures. Furthermore, despite our exhaustive attempts to find all the sources of variation in the outcomes noted, the differences in the aggregation of neonatal morbidity events could not be associated with any of the other variables. This lack of association implies that an important variable was overlooked. Whether this variable was a site effect, an effect of association with nonphysician staff, or some factor not yet recognized would all be speculative. How the accommodation of this factor (or factors) into the study would have affected the results presented here is also speculative, but obviously important.

The search for additional hard number benefits of continuity of care will continue. What differences in these benefits could be found in a population at lower risk than those studied here or with the increased power of a larger study? What is there about those extra 3.5 prenatal visits that translate into improved outcomes? Is prenatal continuity all that is important, or are there benefits to having the prenatal physician also be the delivering physician? How can similar studies be formed to investigate effects of continuity in care on chronic illnesses?

We are in an age of insurance "carve-outs" for specific diagnoses and specialty clinics dedicated to a specific illness. The benefit of continuity of care is a question basic to family practice. The results of this study indicate that continuity in prenatal care is not just a matter of improved patient compliance or satisfaction but, indirectly, a matter of improved postnatal outcomes.

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