Adverse Perinatal Outcomes: Is Physician Specialty a Risk Factor?

Peter Franks, MD, and Steven Eisinger, MD
Rochester, New York

An investigation was conducted in a community hospital to determine whether physician specialty (obstetrics vs family medicine) is a risk factor for adverse perinatal outcomes. Over a three-year period, there were 6,856 deliveries, of which 713 (10.4 percent) were attended by family physicians. Overall, there were 301 (4.4 percent) cases with adverse outcomes, of which 32 (10.6 percent) were attended by family physicians. The charts of a weighted random sample of 117 cases with adverse outcomes and 468 controls were reviewed to determine potential risk factors, including prenatal risk status, race, insurance, and specialty of the attending physician. The risk ratio for family physician as attending was 0.99 (95 percent confidence interval, 0.69 to 1.42) after multivariate adjustment for the other risk factors. Only high prenatal risk status was found to be an independent predictor (risk ratio 1.75, 95 percent confidence interval, 1.23 to 2.49). A chart review of a random sample of 146 patients (73 each of family physicians and obstetricians) revealed no difference in the proportion of high-risk patients in each specialty. It is concluded that in the setting studied, specialty is not a risk factor for adverse perinatal outcomes, and that this finding is not confounded by the patient's prenatal risk status.

Because of the differences between family physicians and obstetricians, the relationship between perinatal outcome and physician specialty is a legitimate concern to both patients and the medical profession. There have been relatively few US investigations of this issue, and the most extensive studies have been conducted in England. Black[1] found no difference in the perinatal mortality rates in two different areas of Oxfordshire for the years 1970 to 1979. Obstetricians performed 90 percent of the deliveries in one area and 55 percent in the other; the remainder were performed by general practitioners. Klein et al[2,3] in a retrospective study found differences in both perinatal and maternal morbidity that favored general practitioner care over shared obstetrician and general practitioner care. The relevance of these studies to the United States is hard to determine because of training and practice style differences between the two countries.

Submitted, revised, November 24, 1986.

From the Department of Preventive, Family, and Rehabilitation Medicine, and the Department of Obstetrics and Gynecology, University of Rochester School of Medicine and Dentistry, Rochester, New York. Requests for reprints should be addressed to Dr. Peter Franks, Family Medicine Center, 885 South Avenue, Rochester, NY 14620.

In the United States, Caetano[4] examined census data of all the deliveries in San Bernardino County in 1973 to compare those handled by obstetricians with those handled by general practitioners. He found that general practitioner deliveries were associated with more birth injuries and congenital malformations. General practitioners reported more prenatal complications, but a similar delivery complication rate. Unfortunately, no multivariate adjustment was performed to determine whether the differences in the birth injury and prenatal complication rates were because of specialty or differences in the patient population. Other studies[5–7] have examined differences in the process of care between obstetricians and family physicians but have been too small to examine differences in perinatal outcome.

Case-control studies provide a method of examining potential risk factors (such as physician specialty) for relatively rare events (such as adverse perinatal outcomes). Niswander et al[8] found that the case-control method was effective in examining the relationship between preventable adverse outcomes of pregnancy and suboptimal intrapartum obstetric care defined by clinical consensus. Kramer et al[9] used a case-control approach to investigate whether pediatrician or nonpediatrician generalists were better able to recognize severe acute illness or to avoid

TABLE 1. RESULTS OF CASE-CONTROL STUDY COMPARING PHYSICIAN SPECIALTY AMONG CONTROLS AND CASES BY COMMITTEE ASSIGNMENT

		Cases by Committee Assignment					
	Controls No. (%)	Not Preventable* No. (%)	Management Question No. (%)	Possibly Preventable No. (%)	Probably Preventable No. (%)	Preventable No. (%)	Totals No. (%)
Obstetrician	418 (89)	44 (96)	15 (94)	28 (82)	10 (83)	8 (89)	523 (89)
Family physician	50 (11)	2 (4)	1 (6)	6 (18)	2 (17)	1 (11)	62 (11)
Totals	468 (100)	46 (100)	16 (100)	34 (100)	12 (100)	9 (100)	585 (100)

Represents a 20 percent sample of all nonpreventable cases. Overall, 230 cases were assigned as nonpreventable, of which 20 (9 percent) were delivered by family physicians

preventable complications and also concluded that the case-control method was useful in studying the quality of medical care.

An important confounding factor in obstetric outcome is the mother's prenatal risk status. Fortney and Whitehorne[10] reviewed a number of risk assessment scores and their performance in predicting perinatal outcome. They concluded that the most useful index developed up until that time was that of Goodwin et al.[11] This index includes items referring to age, past obstetric history, emergent prenatal problems, medical problems, gestation, and number of prenatal visits. Fortney and Whitehorne[10] also developed their own index of high-risk pregnancy. This index includes additional items referring to emergent intrapartum problems.

This article reports the results of an investigation into adverse perinatal outcomes to determine whether specialty (family physician or obstetrician) is a risk factor. The purpose of this study was to determine whether any burden of risk is imposed by registration with a family physician; that is, does care by a family physician, with obstetrician consultation as needed, impose an increased risk of an adverse perinatal outcome compared with care by obstetricians alone? The potential confounding effect of the patient's insurance (as a proxy measure of socioeconomic status), race, and prenatal risk factors were also examined.

METHODS

Information on the perinatal outcomes of all deliveries at Highland Hospital between July 1981 and June 1984 formed the initial database for this study. The hospital is a community hospital, one of five (three community, one secondary, and one tertiary care hospital) providing obstetric services in Monroe County, a metropolitan area in upstate New York with a population of 700,000.

The family physicians that admit patients to the hospital are all residency trained. Faculty of the Family Medicine Program (FMP) at the hospital attend the deliveries of patients of residents in the FMP. Prenatal obstetric consultation for patients of residents in the FMP is routinely expected and is easily available for all patients of family physicians. Obstetric consultation is mandatory for all major intrapartum complications arising in patients of family physicians; otherwise, obstetricians are not involved in the delivery of patients of family physicians. All family medicine resident deliveries are attended by a family medicine attending physician as well as by the resident. The hospital is university affiliated; all other deliveries are attended by a resident.

The hospital has a perinatal morbidity and mortality committee (PMMC), which consists of three obstetricians and two pediatricians. This committee reviews all adverse outcomes, which are defined as any of the following: a 5-minute Apgar of less than 7, any significant birth injury, transfer to the tertiary care nursery, admission to the hospital's own special care nursery, and perinatal death. The committee assigns adverse outcomes by consensus to one of the following categories: nonpreventable, management question (implying a question about the appropriateness of the management without the implication that the management resulted in the adverse outcome), possibly preventable, probably preventable, and preventable.

The investigation comprised three components. The first was a review of the overall statistics for the study period—the total number of deliveries and adverse perinatal outcomes, and the proportions delivered by family physicians. Second, the case-control design was used to study the potential confounding effect of other risk factors. Finally, a separate chart review (prevalence study) was conducted to determine the prevalence of prenatal high-risk status and the potential for confounding.

The cases (adverse perinatal outcomes) used for the case-control study included a 20 percent random sample of cases assigned by the PMMC to be nonpreventable, and all other cases presented during the study period. The

TABLE 2. RESULTS OF CASE-CONTROL STUDY COMPARING PHYSICIAN SPECIALTY AMONG EACH TYPE OF ADVERSE OUTCOME

	Family Physician No. (%)	Obstetrician No. (%)
Perinatal deaths	3 (5)	9 (2)
Birth injury	2 (3)	3 (1)
Transfer to tertiary care	6 (10)	46 (9)
Special care nursery	4 (6)	27 (5)
Apgar < 7	10 (16)	61 (12)
Cases examined	12 (19)	105 (20)
Charts reviewed	62 (100)	523 (100)

Note: The percentages refer to the total of charts reviewed for the specialty; several cases had more than one adverse outcome

TABLE 3. RESULTS OF CASE-CONTROL STUDY COMPARING POTENTIAL RISK FACTORS AMONG CASES AND CONTROLS

Potential Risk Factors	Cases No. (%)	Controls No. (%)
Sample size	117 (100)	468 (100)
Nonwhite	19 (16)	57 (12)
Poor*	10 (9)	42 (9)
High-risk index**		
Goodwin et al[11]	58 (50)	100 (21)
Fortney & Whitehorne[10]	30 (26)	40 (9)
Mode of delivery***		
Vaginal	77 (66)	394 (84)
Elective cesarean section	17 (15)	42 (9)
Emergency cesarean section	23 (20)	32 (7)
Family physician	12 (10)	50 (11)
Low birth weight**	39 (33)	21 (4)

** Poor, Medicaid or Hill Burton eligibility*
*** Difference between cases and controls significant (χ^2, df = 1, P < .0001)*
**** Difference between cases and controls significant (χ^2, df = 2, P < .0001)*

weighted sampling was used to maximize the efficiency of the study within the resources available. Four controls were selected to be the 5th, 10th, 15th, and 20th delivery following each case.

A chart review was conducted on each case and its associated controls by a research assistant blinded to specialty and study hypothesis. Information gathered by chart review included race, insurance (Medicaid, Hill-Burton, or private insurance—as a proxy measure of economic status), and name of the attending physician (later recoded as specialty). Information was also gathered to allow construction of two indices of high-risk pregnancy.[10,11] The sample size and weighting were determined to enable narrow confidence intervals to be set around any negative findings (that is, a risk ratio of 1 with 95 percent confidence interval of 0.5 to 2.0).[12]

Finally, for the separate investigation (prevalence study) into the potential confounding effect of prenatal risk status, a random sample of 10 percent of all deliveries by family physicians was identified. The charts of each family physician delivery selected and that of the most proximal subsequent delivery by an obstetrician were also reviewed for those items examined in the case-control study.

The relationship between specialty and other independent, possibly confounding variables (race, insurance, and prenatal risk factors) was investigated using chi-square tests. Unmatched and matched conditional logistic regression analyses were used to determine whether specialty was a risk factor for presentation to the committee after adjusting for the other independent and possibly confounding variables.

RESULTS

During the study period, 27 obstetricians and 15 family physicians attended a total of 6,856 deliveries, of which 713 (10.4 percent) were attended by family physicians. There were a total of 301 (4.4 percent) cases presented to the PMMC, of which 32 (10.6 percent) were attended by family physicians. Thus, the overall data revealed no association between specialty and adverse outcomes ($\chi^2 = 0.018$, $df = 2$, $P > .9$). Based on these data, the unadjusted risk ratio for family physicians as a risk factor for adverse outcomes is 1.026 (95 percent confidence interval, 0.71 to 1.49).

For the case-control study the charts of 117 cases and 468 controls were reviewed. The distribution of these cases and controls by specialty and the determination of the PMMC is displayed in Table 1, and the particular categories of adverse outcomes are displayed in Table 2. Adverse outcomes were not associated with any particular individual attending physicians, with 30 physicians (25 obstetricians and 5 family physicians) having cases presented, and no physician having more than ten cases.

The case-control data summarized by whether the committee reviewed the case are displayed in Table 3. Results of the case-control study confirm the overall data, the proportion of cases presented by specialty reflecting that of the distribution of deliveries as a whole. Adverse outcomes were significantly associated with cesarean sections, but there was no statistically significant relationship between specialty and cesarean section. Excluding patients undergoing cesarean section did not change the direction or significance of the results reported below.

Using the cutting point recommended by Fortney and Whitehorne, [10] the sensitivity of the Goodwin index for predicting presentation to the committee was 50 percent and its specificity was 79 percent. Sensitivity for the Fort-

TABLE 4. RESULTS OF LOGISTIC REGRESSION OF CASE-CONTROL DATA WITH ADVERSE OUTCOME (VS CONTROL) AS DEPENDENT VARIABLE, AND OTHER POTENTIAL RISK FACTORS AS INDEPENDENT VARIABLES

Independent Variable*	Beta	Standard Error for Beta	Risk Ratio	95 Percent Confidence Interval	P
Specialty	−0.01	0.18	.99	.69–1.42	.94
Risk status	0.56	0.18	1.75	1.23–2.49	<.01
Insurance	−0.24	0.20	.79	.53–1.16	.25
Race	0.15	0.15	1.16	.87–1.55	.33
Specialty and risk status interaction	0.13	0.18			.46

* *Each variable dichotomized, 1 = family physician, high risk, nonpoor, nonwhite (0 = alternative)*

ney index was 26 percent, and its specificity was 91 percent. Neither index revealed a significant association between prenatal risk status and specialty. Because of its better overall predictive value, the Goodwin index was used in subsequent analyses.

The potentially confounding effect of prenatal risk status, race, insurance, and the possible interaction between specialty and risk status were examined in a series of logistic regression analyses of the case-control data. Matched and unmatched analyses gave similar results. For this reason, an unmatched analysis only is displayed in Table 4. After multivariate adjustment only high-risk status remained a significant predictor of adverse outcome. Similar results were obtained when adverse outcomes included only those cases assigned by the PMMC to be at least possibly preventable. Use of the risk status score as a continuous rather than categorical variable in these analyses did not affect the significance of the results.

For the prevalence study, a review was conducted of 146 charts, 73 each of patients with babies delivered by family physicians and obstetricians. The main demographic, prenatal, and outcome characteristics of these patients are displayed in Table 5. No statistically significant differences were evident. Using Goodwin's index, the odds ratio for patients of family physicians being higher risk than those of obstetricians was 1.01 (95 percent confidence interval, 0.49 to 2.4).

DISCUSSION

The results of the case-control study, adjusting for risk factors, confirm the overall hospital results that, in the study setting, specialty (family physician or obstetrician) is not a risk factor for adverse perinatal outcomes. Confidence in this conclusion is increased by the finding in the prevalence study that the major risk factor for outcomes resulting in presentation to the PMMC, that is, the patient's prenatal risk status, was equally distributed between family physicians and obstetricians.

The absence of significant association between prenatal risk status and specialty suggests that, in the hospital studied, the care of high- or low-risk patients by obstetricians alone conferred no advantage in perinatal outcome. Two caveats are in order. In the study setting, obstetric consultation is easily accessible both prenatally and in the event of intrapartum emergencies. Furthermore, most patients of both family physicians and obstetricians who present in labor before 34 weeks were not included in the analysis, as hospital policy mandates transfer of all such patients to the tertiary care hospital, if possible. Thus, it remains possible in this small group of patients that there exists some differences in outcome between specialties. A selection bias is unlikely, however, because these patients are evaluated by the house staff, and after referral the delivery is usually conducted by the perinatal team at the tertiary care hospital.

The trend for cases of family physicians to be labeled more preventable than those of obstetricians (Table 1) is probably either an artifact or a bias of the PMMC. Overall, patients of family physicians did not have a proportionate excess of adverse outcomes and had no difference in risk status. Thus, there is no obvious clinical explanation for the proportionate reduction in adverse outcomes labeled management question and nonpreventable. Because it is difficult to determine the validity of the PMMC determinations, most emphasis in the analysis is placed on the proportion of adverse outcomes for each specialty.

It is possible that an improved index of prenatal risk status might reveal significant confounding. Post hoc adjustment of the cutting point resulted in an improved sensitivity of 72 percent, with a specificity of 57 percent. This adjustment did not change the direction of the results. Furthermore, the results were not significantly affected when the raw Goodwin index score was used in the analyses. It is interesting to note that an analysis by Molfese et al,[13] comparing several risk status scales, found that

TABLE 5. CHARACTERISTICS OF RANDOM SAMPLE (PREVALENCE STUDY) OF FAMILY PHYSICIANS AND OBSTETRICIANS

Characteristic	Family Physician No. (%)	Obstetrician No. (%)
Number	73 (100)	73 (100)
Nonwhite	10 (14)	8 (11)
Poor	21 (29)	7 (10)
Age < 18 years	1 (1)	0 (0)
Age > 35 years	3 (4)	2 (3)
Primaparas	31 (42)	35 (48)
Diabetes	4 (5)	2 (3)
Toxemia	0 (0)	1 (1)
Hydramnios	1 (1)	0 (0)
Prenatal bleeding	2 (3)	0 (0)
Fewer than 4 visits	20 (27)	17 (23)
Gestation < 37 weeks	4 (5)	4 (5)
Forceps/vacuum	2 (3)	6 (8)
Cesarean section		
Repeat	2 (3)	6 (8)
Emergent	3 (4)	5 (7)
Low birth weight	1 (1)	4 (5)
High-risk (Goodwin et al[11])	16 (22)	15 (21)

antepartum scales in general were better predictors of infant outcome than intrapartum scales, and that the most recently developed scales did not perform better than the older scales.

Generalizability of these findings may be limited by the special circumstances of the study setting. The obstetricians represent a broad age range of community obstetricians. In contrast, the family physicians were predominantly residents, family medicine faculty, or recent graduates of the family medicine program.

The authors concur with Kramer et al[9] that the case-control methodology is an appropriate approach to studying quality of care. Biases of selection, measurement, and confounding are unlikely to have occurred in this study design, and all the relevant methodologic criteria suggested by Horwitz and Feinstein[14] were met.

These findings are reassuring in that at least in the hospital examined, no burden of risk is imposed by registration with a family physician. Clearly the study needs to be repeated in other settings, particularly those without residencies; but if the results are confirmed, the emphasis of analysis should focus on other outcomes such as maternal morbidity, satisfaction, costs, and family assessment.

Acknowledgment

This study was supported in part by a grant from the Family Health Foundation of America.

References

1. Black N: Do general practitioner deliveries constitute a perinatal mortality risk? Br Med J 1982; 284:488–490
2. Klein M, Lloyd I, Redman C, et al: A comparison of low-risk pregnant women booked for delivery in two systems of care: Shared-care (consultant) and integrated general practice unit. I. Obstetrical procedures and neonatal outcome. Br J Obstet Gynaecol 1983; 90:118–122
3. Klein M, Lloyd I, Redman C, et al: A comparison of low-risk pregnant women booked for delivery in two systems of care: Shared-care (consultant) and integrated general practice unit. II. Labour and delivery management and neonatal outcome. Br J Obstet Gynaecol 1983; 90:123–128
4. Caetano D: The relationship of medical specialization (obstetricians and general practitioners) to complications in pregnancy and delivery, birth injury, and malformation. Am J Obstet Gynecol 1975; 123:221–227
5. Shear CL, Gipe BT, Mattheis JK, et al: Provider continuity and quality of medical care: A retrospective analysis of prenatal and perinatal outcome. Med Care 1983; 21:1204–1210
6. Phillips WR, Rice GA, Layton RH: Audit of obstetrical care and outcome in family medicine, obstetrics, and general practice. J Fam Pract 1978; 6:1209–1216
7. Ely JW, Ueland K, Gordon MJ: An audit of obstetric care in a university family medicine dapartment and an obstetrics-gynecology department. J Fam Pract 1976; 3:397–401
8. Niswander K, Elbourne D, Redman C, et al: Adverse outcome of pregnancy and the quality of obstetric care. Lancet 1984; 2:827–831
9. Kramer MS, Arsenault L, Pless IB: The use of preventable adverse outcomes to study the quality of child health care. Med Care 1984; 22:223–230
10. Fortney JA, Whitehorne EW: The development of an index of high-risk pregnancy. Am J Obstet Gynecol 1982; 143:501–508
11. Goodwin JW, Dunne JT, Thomas BW: Antepartum identification of the fetus at risk. Can Med Assoc J 1969; 101:57–67
12. Schlesselman JJ: Case-Control Studies. New York, Oxford University Press, 1982
13. Molfese VJ, Thomson BK, Bennett AG: Perinatal outcome: Similarity and predictive value of antepartum and intrapartum assessment scales. J Reprod Med 1985; 30:30–38
14. Horwitz RI, Feinstein, AR: Methodologic standards and contradictory results in case-control research. Am J Med 1979; 66:556–564