

SECTION 3: CASE STUDIES

Reducing Cesarean Birth Rates With Data-driven Quality Improvement Activities

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ABSTRACT. Reduction of cesarean section rates has been a difficult process that has not been easily accomplished by the institution of guidelines. It is more a process of changing physician behavior rather than of medical education. This article analyzed the role of intensive feedback of outcomes to bring about such changes. Two large private obstetric services in San Francisco, CA, were studied. Intensive outcomes feedback using a computerized information system, The Perinatal Data Center, regarding cesarean birth rates and a variety of obstetric outcomes was provided to the medical and nursing staff at one hospital. The other center served as a control. After the first observation period, the outcomes system was introduced to the second hospital. Finally, "open label" feedback, intradepartmental release of everyone's key statistics with names attached, was performed. Active management of labor was not practiced at either hospital.

Results. Cesarean birth rates were stable in the baseline period from 1980 through 1988 at 24% to 25%. Introduction of the Perinatal Data Center outcomes system was associated with a reduction to 21% at the first hospital with no change in the control hospital. Subsequent introduction of the system 3 years later in the control hospital resulted in a decline from 25% to 20.5%. After merger of the two obstetric units and the institution of "open label" feedback, an additional decline to 18.5% was observed.

Conclusion. Physician practice patterns and cesarean birth rates can be altered with the intensive use of comparative outcome data and strong physician leadership. Nonblinded, intradepartmental distribution of outcomes is an even more effective tool. *Pediatrics* 1999;103:374-383; cesarean section, cesarean birth rates.

ABBREVIATIONS. ICD9, International Classification of Diseases, Rev 9; CHSF, Children's Hospital of San Francisco; PPMC, Pacific Presbyterian Medical Center; CPD, cephalopelvic disproportion; VBAC, vaginal birth after a prior cesarean section; AMOL, active management of labor.

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Changing physicians' practice patterns to reduce cesarean birth rates has not been easily accomplished. Government agencies, professional associations, physician leaders, managed care organizations, and consulting groups all have struggled with this issue for more than 20 years. Although the national and state rates are now 10% to 20% below their peak in 1988 (which translates to a 1% to 3% reduction in the total cesarean rate), most are not near the national Healthy Person 2000 goal of 15%.¹

The "cesarean problem" that first seemed to be an American affliction is now international. England and Scotland have regions with rates of 18% or higher,^{2,3} Puerto Rico has a rate of 31.4%,⁴ and Brazil is nearing 35%. On the other hand, many northern European nations with comparable socioeconomic profiles have rates <12%.⁵ Less well understood is that there is a large rate of variation in cesarean birth rates at all levels of subnational comparison: state to state; hospital to hospital; and, most importantly, physician to physician. The study of variation in the rate of medical interventions was begun by Wennberg in the 1970s. His group analyzed the geographic variability of common surgical procedures first in Vermont and Maine and subsequently in many locations, and found that a women's chance of having a hysterectomy by age 70 was as high as 70% in some markets and as low as 20% in others.^{6,7} This has led to interest and research into the medical and nonmedical reasons for such variations.

There is tremendous geographic variation in cesarean section rates within the United States. Table 1 displays the little recognized but extreme variation among states that has not changed appreciably from 1989 to 1996. For example in 1996, although the national total cesarean rate has dropped to 20.8%, some states such as like Arkansas, Louisiana, and Mississippi have rates from 25.2% to 26.6%, and such as Colorado (15.1%) and Wisconsin (15.6%) are nearly at the Healthy Person 2000 goal of 15%. Also of note is that although some areas (Washington, DC, Kansas, and Ohio) had $\geq 20\%$ decreases in cesarean rates in the period from 1989 to 1996, others (Alaska, Maine, and South Dakota) actually increased by 5% to 11%.^{4,8-10}

As practitioners, we are well aware that hospitals' cesarean birth rates also vary greatly from one to another within the same geographic area. For exam-

TABLE 1. US Cesarean Birth Rates for Selected Years (From the National Center for Health Statistics.⁸⁻¹⁰)

Area	1989	1990	1991	1995	1996	% Decline 1989 to 1996
United States	22.8	22.7	22.6	20.8	20.6	9.6%
Alabama	25.6	25.9	25.1	23.4	23.4	8.6%
Alaska	15.2	15.1	16.3	14.4	16.6	-9.2%
Arizona	18.5	18.4	18.3	16.8	16.0	13.5%
Arkansas	27.0	27.7	27.4	25.6	25.2	6.7%
California	22.6	22.3	22.3	20.6	20.5	9.3%
Colorado	17.6	17.0	16.3	15.2	15.1	14.2%
Connecticut	21.2	21.7	22.6	19.2	19.8	6.6%
Delaware	24.0	25.1	22.5	21.5	21.0	12.5%
D.C.	27.1	26.1	25.2	22.0	21.2	21.8%
Florida	25.6	25.3	23.9	21.7	21.6	15.6%
Georgia	23.0	22.9	22.1	21.2	20.9	9.1%
Hawaii	20.9	20.2	20.6	18.5	17.6	15.8%
Idaho	19.6	18.8	17.9	15.7	16.0	18.4%
Illinois	22.7	22.6	22.2	19.9	19.3	15.0%
Indiana	20.9	21.9	21.6	20.7	20.5	1.9%
Iowa	20.0	20.6	20.6	18.6	18.6	7.0%
Kansas	24.0	23.6	23.2	19.7	19.2	20.0%
Kentucky	24.8	24.9	24.8	22.0	21.3	14.1%
Louisiana	NA	27.0	27.9	27.2	26.4	2.2%
Maine	19.6	21.3	21.3	21.0	20.8	-6.1%
Maryland	NA	25.0	24.3	22.0	21.7	13.2%
Massachusetts	22.9	22.5	22.2	20.6	19.8	13.5%
Michigan	22.9	22.0	21.6	20.3	20.1	12.2%
Minnesota	18.6	18.0	17.0	16.3	17.0	8.6%
Mississippi	25.9	26.6	26.9	25.9	26.6	-2.7%
Missouri	23.1	22.9	22.5	20.5	20.3	12.1%
Montana	20.2	20.6	20.2	19.1	19.1	5.4%
Nebraska	NA	19.2	19.6	19.2	19.9	-3.6%
Nevada	NA	19.7	20.2	19.2	19.3	2.0%
New Hampshire	22.2	21.8	21.4	20.0	20.2	9.0%
New Jersey	25.7	24.8	22.0	23.3	24.0	6.6%
New Mexico	18.7	18.4	19.0	18.1	17.2	8.0%
New York	23.6	23.5	23.3	22.7	22.8	3.4%
North Carolina	23.3	22.7	22.4	21.7	21.1	9.4%
North Dakota	19.5	19.4	19.2	19.3	18.9	3.1%
Ohio	24.2	23.8	23.4	19.6	19.0	21.5%
Oklahoma	NA	NA	23.7	22.8	22.5	5.1%
Oregon	19.6	19.0	18.7	17.4	16.9	13.8%
Pennsylvania	22.5	22.3	22.2	19.7	19.4	13.8%
Rhode Island	20.1	19.4	19.4	18.4	17.7	11.9%
South Carolina	22.7	22.4	22.5	22.4	22.5	0.9%
South Dakota	18.7	19.5	20.2	19.9	20.8	-11.2%
Tennessee	24.3	24.4	23.2	21.2	21.7	10.7%
Texas	25.0	24.5	27.2	23.6	23.1	7.6%
Utah	17.7	17.7	17.8	16.3	16.0	9.6%
Vermont	18.7	19.3	19.8	16.7	16.5	11.8%
Virginia	24.5	23.7	23.1	21.3	22.1	9.8%
Washington	20.1	19.7	18.9	17.1	16.8	16.4%
West Virginia	25.2	26.7	25.8	23.5	22.8	9.5%
Wisconsin	17.7	17.6	17.4	15.4	15.6	11.9%
Wyoming	18.9	19.9	19.5	17.9	18.3	3.2%

ple, Porreco noted that in 1986, Denver hospitals with >1500 births had cesarean birth rates that ranged from 12.4% to 24.1%.¹¹ In 1983, Williams and Chen noted in reviewing California birth certificates that primary cesarean birth rates ranged threefold in the state.¹² They then suggested that dissemination of such data could be used to educate (or shame) providers into changing their behaviors. Stafford found similar results looking at California discharge diagnosis datasets.¹³ This later research became the foundation for a program whereby a coalition of health care purchasers, the Bay Area Business Group on Health (now the Pacific Business Group on Health), provided risk adjusted hospital specific cesarean section rates to hospitals. Needless to say they also

suggested directly to chief executive officers of institutions with high risk-adjusted cesarean rates that this was an “opportunity for improvement.”

Extending the observation of variation in practice to the lowest level, we and others observed that physician-specific cesarean rates also ranged widely within an institution.¹⁴ This would appear to be a perfect entrée for quality improvement at the hospital/physician level. Simply, if doctors A, B, and C could have cesarean rates of <10%, it does not stand to reason that other doctors at the same institution with similar patients could justify cesarean rates of 28% to 32%. For departmental leadership, this was indeed an “opportunity for improvement.” In this article, the approach to reduce cesarean birth rates

taken at California Pacific Medical Center using intensive feedback of outcome statistics is described.

METHODS

In 1988, we began development of an outcomes and report-generating computer system, called the Perinatal Data Center, that would serve the needs of intensive care and regular nursery, obstetrics, and nursing. It was envisioned that all data pertaining to the care of mothers and their infants would flow through a single system. To accomplish that, we included birth certificates, International Classification of Diseases, Rev 9 (ICD9) coding, and perinatal quality assurance and improvement. In return for data entry, the physicians and nurses get a host of reports and paperwork completed. These outputs include delivery notes, discharge summaries, ICD9 coded face sheets, home health referrals letters, newborn metabolic screening forms, and labor/delivery and nursery logbooks. There is a full range of maternal and neonatal outcomes automatically tracked, calculated, or reported on. A quality improvement module identifies and abstracts cases by preset criteria for peer review. The system recently has undergone significant expansion and now is being developed, distributed, and supported by Site of Care Systems, San Francisco, CA. A major use of the Perinatal Data Center from the outset was for surveillance of our department's cesarean birth rate and as a tool for the reduction the numbers of cesarean births.

The two hospitals studied in this report began as Children's Hospital of San Francisco (CHSF). Throughout the 1980s, CHSF had from 3200 to 3600 births per year. There was an established high-risk obstetric service, with 150 maternal transports per year. CHSF was a major training site for obstetric residents and medical students of the University of California, San Francisco. In 1987, three groups of obstetricians with one third of the maternity volume left CHSF and opened a new obstetric service at Pacific Presbyterian Medical Center (PPMC) approximately 1.5 miles away. The PPMC "experience" serves as our initial control group. The two hospitals' obstetric departments had similar types of postgraduate training (91% vs 94% university training programs); similar provider demographics (women vs men and mean age of practitioner); and a similar payer mix. The one major difference was that the high-risk obstetrics and maternal transport programs stayed at CHSF. Over the 5-year period from 1987 to 1992, there was limited social contact but almost no professional contact between the two medical staffs. This limited the potential for cross-contamination of new programs and interventions.

On January 1, 1989, the Perinatal Data Center was introduced at CHSF. During the initial 3 years, there was production of daily reports as well as release of individual and coded group comparison statistics at department meetings. The process created considerable stir and was followed with great interest. Figure 1 gives an example of the individual staff member "report card" for a 3-month period. Similar "report cards" also were generated for practice groups as a whole. At the same time, coded staff reports comparing each obstetrician to all others in the department were created (obstetricians were given their own code number but not that of their peers). Figure 2 illustrates how the staff could learn where they stood in relation to their peers. For physicians covering a midwife practice, the Perinatal Data Center removed those deliveries from the physicians' personal statistics and added them to the separately tracked midwife group.

Departmental attention was directed to those providers who were "high achievers." For example, in Figure 2 those with cesarean birth rates <14% were featured (indeed there were three with rates <10%). Recognition and praise from the chairman of the department, the chief of obstetrics, and the chair of the perinatal committee all were publicly accorded to those in the best quartile. In contrast, those in the worst quartile were bolded, and "assistance" (private discussion) was given as to how to "be like" the <10% group. Much public attention was given to the variation of the individual provider's numbers and how that created an opportunity for improvement. Several Grand Rounds per year were devoted to issues involving cesarean birth rates, but mandatory guidelines were not used.

In January 1992, the Perinatal Data Center was introduced to the control hospital (PPMC). Reports were generated in the identical blinded manner, and departmental leadership highlighted the best and worst quartiles. The following year, the two hospitals rejoined with a single obstetric unit in place by June 1993. Because

the numbers were not yet at the preliminary goal of a total cesarean rate of 18%, discussions were held each year with the departments about removing the codes and putting names on the numbers—albeit for internal peer-review use only. In 1993, wraps were taken off the names at the time of the annual review of individual numbers. Because this was what had been discussed previously for 3 years, when it finally occurred it was well accepted.

Also new in 1993 was the introduction of computer-based protocol audits. It was suggested that the OB/GYN Department follow the American College of Obstetricians and Gynecologists Criteria Sets (checklists) before repeat cesarean birth or cesarean for dystocia/cephalopelvic disproportion (CPD). Because we had 800 to 1000 cesarean births per year, it was too time-consuming to review each medical record for baseline quality improvement issues. Therefore, we designed a computer algorithm that would do the first review on the electronic portion of the charts with these indications for cesarean birth. The two algorithms are shown in Tables 2 and 3. Each was run once per year, with results reported to the department as well as to individual providers as required.

From early in the process, individual physicians complained that their cesarean birth rates were high because of their "skewed" patient population. The perinatologists pointed out that they had a large number of higher order multiple gestations, premature breeches, and women with diabetes and severe hypertension. Other obstetricians spoke of their large numbers of nuliparous and older patients. From the outset, we identified on each report card the number of multiples, nulips, and infants weighing <1500 and <2500 g. In 1991, we began reporting nuliparous cesarean birth rates in addition to overall. In 1993, we went a step further and introduced the concept of "standard nulip" and "standard multip" cesarean birth rates. These were defined as singleton, vertex presenting, ≥ 37 weeks of gestation, and without a previous cesarean birth. As seen in Fig 1, standard nulips usually account for half of an individual's births and not only gave a view onto an obstetrician's practice style but also provided an ability to compare "apples to apples" for the department. We are presently working on more complicated risk-adjustment algorithms based on indirect standardization (observed and expected outcomes). Both will be useful. Of interest, however, in discussion with the department there was general distrust of complex statistical manipulations of the data and preference for subset (eg, "standard nulip" and "standard multip") analysis.

We did have a number of practitioners who had relatively small numbers of births per year. Everyone who delivered at least one birth received a report card (Fig 1). Summary comparison reports (Fig 2) were restricted to those practitioners who delivered >20 in a given year. Statistical quality, particularly when considering smaller rates (eg, vaginal birth after a prior cesarean section [VBAC] attempt), was only achieved when the total number of births was >100 per year. In the last several years, we also provided report cards and summary comparison data for the previous 3 years as a group. This provided large numbers even for providers who delivered relatively few babies per year. Of interest, for most practitioners, the 3-year average was quite close to the 1-year report.

In addition, smaller sample sizes were not critical, because the reports were used for educational purposes and peer pressure and not for credentialing or reimbursement, actual statistical significance was not required.

RESULTS

Total cesarean birth were plotted each year for the two hospitals and the combined successor hospital (Fig 3). The baseline period of the 1980s showed a stable rate of 23% to 25%. This had been accepted locally as the price of being a high-risk center. After separation into two obstetric units, the rate continued in the same range. After introduction of the Perinatal Data Center at CHSF in 1989, we began to see a decline. By 1991, this had reached 20.7%, whereas the control hospital (PPMC) was 25.1%. In 1992, the program was introduced to PPMC and the next year, the rate fell from 24.6% to 20.3%. The

Number of Neonatal Deaths: 0		Neonatal Death Rate: 0.0%	
Quarterly Perinatal Statistics			
From 10/1/97 to 12/31/97			
Doe, Jane (delivering MD)			
Total Number of Births: 110		Average Lengths of Stay:	
Total Number of Mothers Delivered: 108		Vaginal PP (Days): 1.61	
% of Mothers Nulliparous: 59.2%		Cesarean PP (Days): 3.13	
Number of Multiple Gestations: 4		All Deliveries AP (Days): 1.30 (Hrs) 17.30	
		All Deliveries Total LOS (Days): 3.13	
Cesarean Sections			
Number of Cesarean Sections: 16		Total C/S Rate: 14.8%	
Number of Prior C/S: 14		VBAC Rate 71.4%	
Number of VBAC Attempted: 10		% VBAC Attempted: 71.4%	
Number of VBAC Successful: 10		% VBAC Successful: 100.0%	
Number of Repeat C/S: 4		Repeat C/S Rate: 3.7%	
Number of Primary C/S: 12		Primary C/S Rate: 11.1%	
INDICATIONS FOR PRIMARY C/S:		CPD/FTP Rate: 6.4%	
Singleton Term Vertex (no prior C/S)		Fetal Distress Rate: 3.7%	
# Primips: 56	C/S Rate: 16.0%	Malpresentation Rate: 0.9%	
# Multips: 28	C/S Rate: 0.0%	Other Rate: 0.0%	
Operative Obstetrics (* = cephalic presentation only)			
Number of Low/Outlet Forceps*: 0		Low Forceps Rate: 0.0%	
Number of Mid Forceps*: 0		Mid Forceps Rate: 0.0%	
Number of Low Vacuums*: 28		Low Vacuum Rate: 25.9%	
Number of Mid Vacuums*: 1		Mid Vacuum Rate: 0.9%	
TOTAL OP. VAGINAL DELIVERIES*: 29		TOTAL OP. DELIV. RATE: 26.8%	
# of Episiotomies (vag. delivs.): 58		Episiotomy Rate: 63.0%	
# of Epidurals (vag. delivs.): 54		Epidural Rate: 58.6%	
Number of Inductions: 18		Induction Rate: 16.6%	
Number of Pit. Augmentations: 21		Pit. Augmentation Rate: 19.4%	
TOTAL PITOCIN PATIENTS: 39		PITOCIN RATE: 36.1%	
(rates are calculated per delivery except Epidural and Epis. rates which are per vaginal delivery)			
Infant Outcomes			
Number of Infants <37 Weeks: 9		Preterm Birth Rate: 8.1%	
Number of Infants <2500 grams: 9		Low Birthweight Rate: 8.1%	
Number of Infants <1500 grams: 0		Very Low Birthrate Rate: 0.0%	
Term Infants 5 min. Apgars <7: 2		Low Apgar Rate: 1.8%	
Term Infants Admitted to ICN: 5		ICN Admit Rate: 4.5%	
Number of Stillbirths: 0		Stillbirth Rate: 0.0%	

Fig 1. Example of outcome statistics (report card) provided to the individual physician.

hospitals merged units in 1993, and open, uncoded comparisons were introduced. The rates fell additionally to 18.3% and 18.1%. When the perinatology high-risk transport service was excluded from analysis, the hospital's cesarean birth rate was now 16.8%.

There were declines in both the primary and the repeat cesarean rates. Baseline rates for CHSF were 15.6% to 16.9% for primary and 8.0% to 8.6% for repeat. Baseline rates for PPMC were 15.2% to 17.8% for primary and 6.8% to 8.1% for repeat. In 1995, these rates were 13.6% and 4.4% for the combined program. This represents declines of 13% for the primary rate and 48% for the repeat rate and an total rate decline of 24.5%. The national total cesarean

birth rate fell 15.3% during the same time period (1987 to 1995).

Figure 4 shows the extreme variability in the individual total cesarean rates for obstetricians in 1992. This was shown to the department, and the graphic made a serious impression. The analysis repeated 3 years later shows improvement across all quartiles, but still showed tremendous variability. This one graphic is used to point out continually the opportunities for improvement. Also noted in the analysis was the observation that the providers in the lower quartile stayed in their quartile year after year, whereas those in the upper quartile, while improving, also maintained their relative position.

Summary Ob Statistics for 1994 (Individuals with over 20 deliveries)
Departmental Quality Assurance Document: Do Not Circulate or Photocopy

Department of Ob/Gyn, California Pacific Medical Center

Name	Total CS (total C/S / total moms)	Repeat CS (total repeat C/S / total moms)	VBAC (%VBAC attempt x %VBAC success)	Primary (total primary C/S / total moms)	CPD (total CPD C/S / total moms)	FD (total fetal distress C/S / total moms)	Op Vag (total forceps + vacuum / total moms)	P=0 (total nuliparas / total moms)	<2500g (total babies <2500g / total births)	Nulip C/S (total nulip at ≥37wk C/S / total nulip at ≥37wk)
A	13.2%	2.9%	77.8%	10.3%	7.4%	0.0%	19.1%	55.9%	4.3%	17.4%
B	20.9%	7.5%	54.5%	13.4%	6.0%	0.0%	11.9%	46.3%	3.0%	27.6%
C	17.7%	3.0%	40.0%	14.6%	9.6%	1.5%	9.6%	56.1%	5.5%	16.3%
D	15.9%	4.5%	55.6%	11.4%	6.8%	0.0%	18.2%	48.9%	7.7%	13.5%
E	33.3%	6.1%	33.3%	27.3%	12.1%	4.5%	15.2%	51.5%	6.0%	23.1%
F	31.4%	9.8%	37.5%	21.6%	19.6%	0.0%	11.8%	62.7%	11.8%	32.3%
G	29.6%	9.3%	37.5%	20.4%	7.4%	0.0%	7.4%	44.4%	10.9%	11.8%
H	26.7%	8.9%	50.0%	17.8%	6.7%	2.2%	6.7%	57.8%	4.4%	26.3%
I	16.9%	0.0%	100.0%	16.9%	8.5%	1.7%	18.6%	52.5%	9.8%	23.1%
J	17.8%	4.4%	0.0%	13.3%	4.4%	2.2%	17.8%	57.8%	4.4%	15.0%
K	25.0%	3.9%	50.0%	21.1%	13.3%	0.0%	5.5%	49.2%	6.2%	34.0%
L	21.4%	2.4%	80.0%	19.0%	11.9%	2.4%	2.4%	47.6%	4.7%	35.3%
M	21.4%	8.3%	46.2%	13.1%	6.0%	1.2%	20.2%	51.2%	6.7%	23.7%
N	17.6%	5.9%	50.0%	11.8%	2.9%	0.0%	17.6%	52.9%	11.4%	7.7%
O	18.3%	5.0%	40.0%	13.3%	6.7%	1.7%	11.7%	46.7%	3.3%	21.7%
P	20.1%	5.7%	51.4%	14.4%	7.7%	1.3%	27.9%	57.7%	6.2%	16.9%
Q	24.2%	6.5%	55.6%	17.7%	6.5%	1.6%	4.8%	41.9%	3.2%	11.1%
R	15.7%	8.4%	46.2%	7.2%	2.4%	2.4%	4.8%	31.3%	2.4%	16.7%
S	17.4%	8.7%	45.4%	8.7%	1.4%	1.4%	4.3%	33.3%	5.7%	5.0%
T	9.5%	4.8%	66.7%	4.8%	0.0%	0.0%	9.5%	52.4%	0.0%	0.0%
U	12.5%	2.1%	75.0%	10.4%	0.0%	4.2%	10.4%	52.1%	4.2%	9.1%
V	10.4%	2.8%	71.4%	7.6%	2.1%	0.7%	20.8%	52.8%	5.6%	6.2%
W	13.8%	0.0%	100.0%	13.8%	5.0%	0.0%	7.5%	55.0%	4.8%	13.5%
X	9.7%	0.0%	0.0%	9.7%	3.2%	0.0%	16.1%	58.1%	6.5%	14.3%
Y	9.6%	2.4%	75.0%	7.2%	3.0%	0.6%	13.3%	56.0%	5.4%	6.0%
Z	11.5%	3.3%	50.0%	8.2%	3.3%	0.0%	18.0%	57.4%	0.0%	6.5%
AA	27.3%	6.5%	28.6%	20.8%	14.3%	3.9%	15.6%	48.1%	5.1%	32.3%
BB	17.3%	8.1%	37.5%	9.3%	4.8%	1.2%	15.3%	46.4%	1.6%	13.7%
CC	10.2%	3.4%	50.0%	6.8%	1.1%	3.4%	31.8%	55.7%	8.8%	8.3%
DD	18.9%	10.8%	55.6%	8.1%	2.7%	2.7%	16.2%	51.4%	8.1%	16.7%
Median	17.6%	4.5%	50.0%	12.5%	6.0%	1.3%	15.2%	52.5%	5.1%	14.3%
BOLD if	≥25%	≥8%	≤40%	≥16%	≥8%	≥4%	≥20%	≥60%	≥8%	≥20%

Fig 2. Example of comparative statistics provided to all practitioners illustrating their own outcome rates as well as those of their peers.

TABLE 2. Algorithm for Perinatal Data Center First Review of Medical Records for the Diagnosis of Dystocia/CPD

Identify all patients who had a cesarean birth for arrest of descent, arrest of dilation ≤3 cm, arrest of dilation ≥4 cm, protracted labor, CPD (fetopelvic disproportion no labor), failed forceps/vacuum, or failed induction. (These are the allowable categories for dystocia/CPD in the Perinatal Data Center.)

Did the patient get beyond 4 cm in dilation?
 If no, refer for chart review and possible QAI action.

Was either oxytocin or an IUPC used?
 If no, refer for chart review and possible QAI action.

Was there at least 2 hours of pitocin or at least 6 hours after 4 cm dilation?
 If no, refer for chart review and possible QAI action.

If diagnosis was failed induction, was there a convincing obstetrical-medical complication such as severe preeclampsia?
 If no, refer for chart review and possible QAI action.

TABLE 3. Algorithm for Perinatal Data Center First Review of Medical Records for the Diagnosis of Previous Cesarean Birth

Identify all patients who had a previous cesarean birth
 VBAC attempted, yes: move to a statistical category to count only
 VBAC attempted, NO
 Review surgical indications for cesarean birth and complications present at admission:
 Was there a new indication?
 If no, then chart review to find possible qualifying factors (patient refusal, macrosomia with previous CPD, desires tubal ligation, etc) or possible QAI action.

as the higher group, and had the same neonatal outcomes as measured by rates of 5-minute Apgar scores and admission to intensive care nursery. It appears that it was not what the "low cesarean" doctors did, but how they did it. This supports the concept that the decision for cesarean birth is complex and includes many medical and "nonmedical" factors.

DISCUSSION

Our ability to obtain major reductions in the rate of cesarean birth by use of intensive outcomes feedback and not by use of medical interventions such as active management of labor (AMOL) is not unprecedented. In a series of important studies, Myers and Gleicher detailed a local quality assessment and improvement program that reduced cesarean birth rates effectively in their inner-city Chicago hospital

Change in Cesarean Section Rate over Time

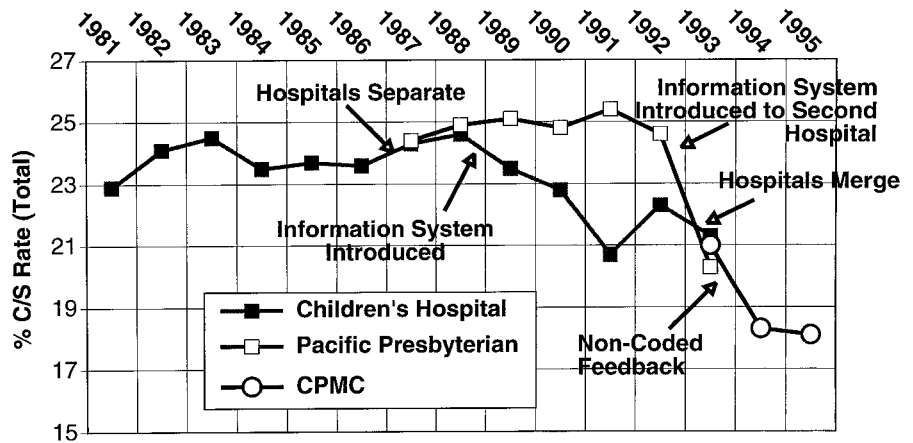


Fig 3. Trends in total cesarean birth rate over the baseline period and during the intervention periods of this study.

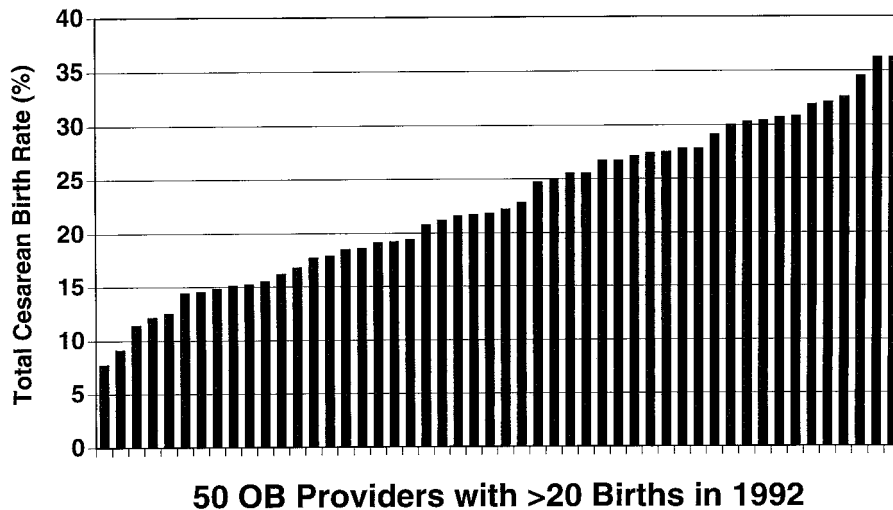


Fig 4. The wide variation in individual total cesarean rate is quite dramatic—ranging from 7.1% to 36.4%.

TABLE 4. Comparison of Practice Patterns of Obstetricians with High and Low Cesarean Section Rates

Obstetrician	CPD CS Rate	Nulip CS Rate	Epidural Rate	Induction Rate	Augment Rate	Op Vag Delivery Rate	5-min Apgar <7 Rate	ICN Admit Rate
A	2.9	5.7	50	10.6	29.7	14.4	1.6	13.3
B	4.0	7.6	51.4	13.7	28.9	11.6	2.5	13.5
C	2.8	6.5	7.6	6.3	15.4	11.5	2.4	7.9
D	3.2	10.8	58.3	20.4	28.9	21.3	1.6	11.5
E	4.6	11.1	50.4	17.7	26.4	21.6	0.7	11.1
AA	9.2	24.2	45.8	13.8	29.7	9.7	1.5	9.0
BB	9.0	24.6	61.0	15.6	26.2	19.2	1.1	10.0
CC	12.5	26.5	19.4	7.9	26.1	19.3	2.2	11.2
DD	11.8	22.3	58.8	20.4	26.1	21.6	2.0	13.2
EE	10.2	22.2	58.7	22.9	28.4	24.3	2.3	10.1

from 17.5% to 11.9%.¹⁵⁻¹⁷ Their approach was to use locally developed practice guidelines in combination with comprehensive data collection and intensive feedback to physicians. Each year, “obstetricians who are identified as outliers—those whose cesarean section rates are reported to be greater than 12%—are invited to a private consultation with the division director to review their individual data.”¹⁵ Their cesarean birth rate of 11% is a tremendous accomplishment. Not everyone is dealt the same cards, however. It should be noted that their population was both young and [m]70% multiparous. Furthermore, they had an unshakable commitment to vaginal

breech delivery, which will be hard to duplicate in all places in the United States. Routine cesarean birth for breech deliveries adds 1.5% to 2% to the total cesarean birth rate (depending on the level of success of the external version program).

At Saddleback Memorial Medical Center, Orange County, CA, Lagrew and Morgan instituted a program of increased consumer awareness, clinical guidelines including more aggressive laboring techniques, and especially (in their view) intensive provider feedback with confidential profiling.¹⁸ Their cesarean rate fell from 31.1% to 15.7% over 6 years. Sandmire and DeMott in Green Bay also have

stressed the importance of physician practice patterns in explaining higher cesarean rates and the use of the hospital peer review process in improving them.¹⁹ In a recent editorial, Sandmire proposes that every obstetric department have a “cesarean birth monitor” who would review with individual obstetricians their cesarean statistics and also review the department’s statistics with an eye on system improvements for labor and delivery.²⁰

The studies noted above and our experience stress the importance of intensive data feedback in concert with strong departmental leadership. Such data, in the absence of recognition, praise, public accord, and private admonishments are unlikely to actually change physician behaviors. Many such projects have failed because of lack of committed leadership.

Our study differs in design from these examples by having a contemporary control group exposed to the same medicolegal and medicoeconomic environment but missing the intensive outcomes feedback. Furthermore the natural “cross-over” design allows for confirmation of effect in the control group when they were exposed to the intervention. Also notable in the current study was the absence of use of AMOL protocols or other mandatory guidelines. This extends the findings of Lagrew and Sandmire that outcomes feedback and providing continuous scrutiny are the most important ingredients for success.

In all US studies, CPD and repeat cesarean section are the dominant indications for cesarean birth. Each accounts for approximately one third of cesarean births (in a range from 28% to 39%).²¹ Practice patterns regarding VBAC section vary widely in the United States. CPD has even greater variation in its use as a diagnosis and as an indication for surgery. When Notzon and colleagues⁵ compared US rates of cesarean birth by indication to those of Norway, Scotland, and Sweden, they found the surprising result that rates for breech, fetal distress, and “other” category were similar in all four countries. What entirely accounted for the double US rate (24% compared with 11% to 13%) were cesarean births for CPD/dystocia and previous cesarean section. Clearly, these two indications have the greatest opportunity for quality improvement. Each has been the focus of practice guidelines by the professional associations and by managed care organizations. For previous cesarean section, VBAC has been encouraged strongly in most settings. For CPD/dystocia, many have recommended AMOL. In recent years, these two major guideline/protocol approaches for cesarean reduction have been reexamined. If, as we shall see, guidelines/protocols are not the full solution, an outcomes driven approach that focuses on changing individual physicians’ practice patterns is even more critical in the efforts to lower cesarean section rates.

Turning first to AMOL, O’Driscoll and colleagues at the National Maternity Hospital in Dublin, Ireland, developed and analyzed an approach to the management of spontaneous labor to minimize cesarean birth for dystocia.²² This protocol, intended only for nuliparous patients, included admission to the labor floor only when in active labor (carefully

defined), early rupture of the amniotic membranes, frequent cervical examinations with use of high-dose oxytocin for those who fail to advance in labor in a prescribed manner, and one-to-one nursing care. Most labors were managed by midwives. Epidural analgesia was used sparingly. Whereas the American cesarean birth rate rose to 25%, the National Maternity Hospital remained in the 6% range. Subsequent observational studies appeared to confirm the benefits of the Irish approach.^{23,24} To many this was sufficient proof that AMOL was the best approach to reduce the cesarean birth rate.

In recent years, several groups have attempted to test rigorously all or parts of the AMOL protocol. Two large randomized controlled trials have been performed in the United States. Northwestern University noted success with AMOL, but the success was modest and only reached significance after a secondary analysis controlling for additional potentially confounding factors.²⁵ Furthermore, there appeared to be spillover effects from the intervention group onto the randomized control group that did considerably better than the historical controls. The intense interest in cesarean reduction appears to have affected all obstetric providers and affected care of all their patients—a classic example of the Hawthorne effect.²⁶ More recently when researchers at Harvard used a similar protocol (but with separate complete labor units to minimize staff “contamination”), there was no effect on cesarean birth rates.²⁷ The best that could be noted was a reduction of the time on the labor unit (with presumed lower costs). A series of randomized trials conducted in England have examined parts of the AMOL approach such as high-dose oxytocin and early artificial rupture of membranes without finding benefit.^{28,29} There currently is significant doubt about which parts of the AMOL protocol are important and where to go with it as a whole. A recent editorial in the *British Journal of Obstetric and Gynecology*, “The active mismanagement of labor,” pointed out that our greatest problem with dystocia/CPD is that we truly do not understand the pathophysiology of labor problems.³⁰ This makes a protocol approach problematic at best.

Midwife groups, including the one at Northwestern University, have pointed out that their cesarean birth rates for nuliparous patients are as good as, if not lower than, those for comparable AMOL managed patients.³¹ Midwife care is characterized by laboring at home as long as possible with admission to the labor unit late in labor, one-to-one supportive care, and active mobility in labor. In contrast to AMOL, midwives tend to have low use of oxytocin, do not adhere to predetermined labor curves, and unlike American AMOL protocols, have low use of epidural analgesia. When one compares these two labor approaches, hospital admission in active phase labor and good labor support appear to be common to both protocols (and therefore deserve careful examination). Also obvious on comparison of the two approaches is that AMOL emphasizes interventions with technology versus midwife care that eschews interventions and tries to maximize normal forces. In some parts of the country, AMOL, because of its

mechanization of the labor process, has not been well received by patients or patient advocacy groups.³² It should be noted that midwife-centered care has led to some of the lowest cesarean birth rates in the United States. A prime example is the joint midwife-obstetrician practice at Sutter Davis Medical Center in California, where the total cesarean birth rate has averaged <10% for 5 consecutive years.³³

The second major opportunity for cesarean birth reduction is that of the indication of previous cesarean section. Multiple studies suggesting that a VBAC was safe were published in the late 1970s and early 1980s. Most were small reports of experiences with 300 to 400 patients that concluded that VBACs were safe for mothers and infants. Still, as late as 1978, 97.4% of women in the United States who had a previous cesarean birth were again delivered abdominally!²¹ Large (5 to 10 000 patients) prospective trials published in the late 1980s and early 1990s³⁴⁻³⁶ showed that VBAC was reasonably safe and effective. The major concern for patients and obstetricians was symptomatic uterine rupture with catastrophic consequences. In these large studies, the rate of uterine rupture appeared to be consistently in the 0.6% to 0.8% range, a small but not inconsequential rate. The frequency of major consequences to the fetus (death and severe perinatal hypoxia/ischemia) of such a rupture is difficult to estimate. Putting together three large series totaling 154 symptomatic uterine ruptures during trial of labor indicates that the risk of these major fetal complications total 4% (6/154).³⁵⁻³⁷ The overall risk then of fetal consequences is 1 to 2 of 10 000 VBAC attempts. On the other hand, successful vaginal births were obtained from 65% to 80% of attempts, providing an apparently quite favorable risk/benefit analysis (not to mention cost/benefit analysis). The American College of Obstetricians and Gynecologists has formally endorsed VBAC.³⁸ With College support and managed care pressure, nationwide rates rose to 27.5% in 1995.³⁹

In 1996, two articles were published that may change the public's perception of the safety of VBAC. The first was a population-based longitudinal study of all women with one previous cesarean birth in Nova Scotia.⁴⁰ In this article, McMahon and co-workers found that major maternal complications were twice as likely to occur in women who attempted a VBAC than in those who elected for a repeat cesarean birth. Also in 1996 was a discussion by Jeff Phelan concerning the medicolegal risks of VBAC.⁴¹ After reviewing several legal cases of damaged infants after uterine ruptures with VBAC that ruled against the obstetricians, he concluded that a comprehensive informed consent for VBAC was needed. He proposed a consent that highlighted the risks to the mother and fetus in such a way that few mothers would be likely to sign it. This has become a very real issue in California, where several major medical malpractice carriers have demanded use of the Phelan consent. As a direct result, in some locations VBAC rates have fallen dramatically. The physician (and patient) is being caught between the dictates of the malpractice carrier and the managed care provider. Fuller informed consent clearly is needed as illus-

trated by the recent \$22 million settlement of malpractice suits against Los Angeles County alleging "VBAC without consent" at county-run hospitals⁴² (where VBAC attempt rates were >80%³⁵). The pendulum appears to be swinging toward having stricter criteria over how VBACs are performed (ie, what in-hospital supports are available for immediate emergency delivery) and what risks are discussed with the patient before the VBAC.

As can be seen from the discussion above, we appear to be moving away from strict practice guidelines (AMOL and VBAC for all) and toward scrutiny of individual practice patterns and behaviors as the driver of cesarean section rate reduction. At the outset, it should be noted that changing behaviors of highly educated adults is not an easy task. Monitoring physician practice patterns requires more sophisticated outcome measurement and reporting. The first response of most physicians whose statistics are compared unfavorably with those of their peers is "my patients are more complicated than average." To make "peer pressure" effective, one needs to go to lengths to demonstrate that intrinsic patient characteristics are not to blame for observed outcome differences. This is equally true whether one is comparing physicians, hospitals, states, or nations. Several approaches to risk adjustment have been applied to cesarean section rates. Some have used hospital billing reports (ICD9 codes),¹³ but these suffer from 1) lack of information regarding parity—the single strongest predictor of cesarean birth, and 2) the tendency to code the chart to justify the operation (ie, dystocia or fetal distress codes are hardly ever used in most hospitals except when there is a cesarean). The modern (post-1989) birth certificate has advantages of being 1) completed on every birth, 2) rich in demographic data, and 3) a good source of certain clinical data such as parity. Unfortunately, birth certificates often incompletely collect many specific diagnoses.¹² The ideal for comparing hospital or larger populations with risk adjustment would be a combination of ICD9 codes collected in the standard manner matched with birth certificate records. This combined approach being developed for use by the California Perinatal Quality Improvement Collaborative to analyze hospital outcomes and cesarean births in the state of California.

Simpler methods have been used successfully. We report here on the use of a "standard nulip" (>37 weeks' gestation, singleton, and vertex); "standard multip" (>37 weeks' gestation, singleton, vertex, and no previous cesarean births). Others have reported a similar concept⁴³ and used it to compare different obstetric units in England. John Elliott and associates⁴⁴ describe a labor-adjusted cesarean section rate that takes into account those gravidas for whom labor was contraindicated. Most recently, Lieberman and associates⁴⁵ have described a case-mix system similar to that outlined stratifying patients based on parity, previous cesarean, plurality, presentation, gestational age, presence of a medical condition precluding trial of labor, and presence of one of a list of medical conditions (eg, hypertension and diabetes). Unfortunately, subjectivity is not fully removed by

these more complex systems (for example, what precludes a trial of labor is not agreed to uniformly). Advanced maternal age plays a controversial role. Some data suggests that there is an underlying physiologic reason for the well-observed high rate of cesarean birth after 35 years of age, whereas others suggest that it is primarily related to physician practices⁴⁵. Source of payment as a risk factor has been studied often but much less often adequately risk-adjusted. For example, Stafford studied source of payment for California cesareans but could not adjust for parity.¹³ McCloskey looked at cesarean rates for dystocia and found that payment source no longer was a significant factor when adjusted for age.⁴²

Despite difficulties in the process of risk adjustment, many states have attempted to develop statewide programs to reduce cesarean births. Looking at published studies, the results appear to be decidedly mixed. New York ran a program from 1989 to 1993, where randomly selected hospitals (intervention group) would have external peer review of cesarean delivery medical records and be given feedback through an exit interview and written summaries of recommendations. Although the cesarean birth rate for the entire state declined during the study period, there was no difference between the intervention group and the controls.⁴⁷ State sponsored programs in Minnesota,⁴⁸ Maryland,⁴⁹ and Massachusetts⁵⁰ during the late 1980s and early 1990s that focused on the generation of “state encouraged” practice guidelines have had variable effects compared with national trends. None have approached the Year 2000 goal of 15%, but Maryland and Massachusetts have dropped 13% (US average decline 9.6%) (see Table 1). The approach taken in Vermont, the Vermont Program for Quality in Health Care, was to monitor health care quality centrally with a statewide database and to actively engage and teach hospitals and physicians the techniques of continuous quality improvement.⁵¹ The studies were “hospital to hospital,” “physician to physician.” The motto was, in effect, “think globally, act locally.” The result was a moderate decline in the cesarean birth rate from 18.7% to the current 16.5%, one of the closest to the Healthy Person 2000 goal.

The Healthy Person 2000 goal has been attacked as “unrealistic” or “unsafe for babies.” First, it should be pointed out that these goals are to be applied to large populations not to individual practices or hospitals who may have adverse patient selection. Most important, however, are the examples provided by practice variation studies. We have seen above that states, hospitals, and doctors vary markedly for cesarean section rates (with some at or below the 15% goal), although at the same time not having lower perinatal mortality rates. Indeed, there is no evidence that the huge increase in cesarean section rate seen over the last 15 years added any improvement to our state or national perinatal mortality rates.

One surprising result of analysis of the guideline movement is that centrally issued guidelines have limited if any effect. As an example, the Consensus Development Conference on Cesarean Childbirth of

TABLE 5. Eight Key Practices for Safely Reducing Cesarean Rates—Coming to Term (Medical Leadership Council of the Advisory Board Company)⁵⁴

Physician profiling/report cards
Aligning financial incentives
Trial of labor after cesarean for appropriate candidates
Guidelines for the diagnosis and cesarean management of dystocia
Patient demand management
Appropriate epidural use
Dedicated inpatient obstetrician on call 24 h inside the hospital
One-to-one coverage throughout labor for support

TABLE 6. Concepts for Cesarean Reduction: Breakthrough Series⁵⁵

Preventing cesareans from failed inductions
Avoiding hospital admissions for false labor
Managing pain more effectively to help women tolerate labor
Expecting a trial of labor (after a previous cesarean)
Enlisting nursing support in labor

the National Institute of Child Health and Human Development convened in 1979 to sound the alarm over the then record high cesarean birth rate of 15%.⁵² Its report was disseminated widely and the national rate rose to 24.7%! After a similar report in Canada, the response to the guidelines was studied carefully.⁵³ They concluded that guidelines for practice only “predisposed” physicians to consider changing their behavior, but unless there are other incentives, actual change will be limited. Because cesarean birth decisions are “local,” activities to bring about change have to be driven locally. There are two recently formed nongovernmental groups that also pay a great deal of attention to high cesarean rates and local responses. The Institute for Health care Improvement of Boston and the Medical Leadership Council of Washington, DC offer (for a fee) information, reports, and programs about how to reduce cesareans. In 1996, the Council published “Coming to Term: Innovations in Safely Reducing Cesarean Rates.” The key eight practices for reducing cesarean rates safely are listed on Table 5.⁵⁴ The Institute has organized a “Breakthrough Series” on cesarean reduction. Its key points are displayed in Table 6, but the reader is referred to an in-depth discussion of the points.⁵⁵ That there are so many ways to act to improve cesarean birth rates illustrates a key point—the more light (activity and interest and feedback) of any kind directed on this problem, the more physicians’ behaviors will change. In a sense, this is intentionally using the Hawthorne effect to improve clinical outcomes.

In our study, the key to bringing about “local” change was to provide irrefutable outcomes data in the context of rekindling the physician’s desire to have a “good cesarean birth rate.” We worked on creating more disincentives to better balance the new advantages of cesarean birth. The process of feedback needs to be ongoing and high profile. The role of physician leaders is critical and needs to be persistent. Reduction of cesarean sections is less about medical education than about creating behavioral and cultural changes in physicians, nurses, and patients.

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