| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:World Health Organization, 1994Country:Indonesia, Thailand, and MalaysiaSystem:Eight maternity hospitalsBaseline period:01/1990 to 06/1990Evaluation period:06/1990 to 04/1991Routine use period:04/1991 to 09/1991Funding:World Health Organization (WHO) and ministries of health of Indonesia, Thailand, and Malaysia**Author industry relationship disclosure:**NR**Design:**Cluster randomized trial (4 matched pairs of hospitals selected; one of each randomly selected to implement use of partogram) | Cesarean reduction intervention:Use of the WHO partogram to inform active management of labor and decisions about need for cesarean | Inclusion criteria: * District general hospitals in urban settings
* Current use of active management of labor

Exclusion criteria: * See inclusion criteria
 | Births, n: Baseline period:18,254Evaluation period:17,230Births to normal1 women, n: Baseline period:10,049Evaluation period: 9,130 Births to normal1 nulliparous women: Baseline period:4,212Evaluation period:3,924Age, mean yrs ± SD:Baseline period:27.23 ± 5.72Evaluation period:27.17 ± 5.75EP/BL: *P* = 0.55Parous, %: Baseline period:61.0Evaluation period:60.8EP/BL: *P* = 0.87**Medicaid:** Not applicable**Private insurance coverage:** Not applicableMultiple gestations, n (%):Baseline period: 239 (1.3)Evaluation period: 247 (1.4) | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous, n (%):**Total singleton births:Baseline period: 13,186 (72.4)Evaluation period:12,704 (73.9)**EP/BL:***P* = 0.201Normal1 women:Baseline period:8,428 (83.9)Evaluation period:7,869 (86.3)EP/BL: *P* < 0.001Normal1 nulliparous women:Baseline period:3,129 (74.3)Evaluation period:3,069 (78.3)**EP/BL:***P* < 0.001**Vaginal, assisted, n (%):**Total singleton births:Baseline period: 1,793 (9.8)Evaluation period: 1649 (9.6)**EP/BL:***P* = 0.110Normal1 women:Baseline period:995 (9.9)Evaluation period: 841 (9.2)**EP/BL:***P* = NRNormal1 nulliparous women: Baseline period:668 (15.9)Evaluation period: 578 (14.7)EP/BL: *P* = NR **Cesarean birth, n (%):**Total singleton births:Baseline period: 2,278 (12.5) Evaluation period: |
| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| World Health Organization, 1994 (continued) |  |  |  |  | 1,926 (11.2)**EP/BL:***P* = 0.841Normal1 women:Baseline period:621 (6.2)Evaluation period: 409 (4.5)EP/BL: *P* = 0.056Normal1 nulliparous women:Baseline period:414 (9.8)Evaluation period: 271 (6.9)EP/BL: *P* = 0.060Maternal outcomes**Maternal mortality, n:**Baseline period: 23Evaluation period: 24**Neonatal outcomesNeonatal mortality:** NR**Apgar score:**NR**NICU admission, %:**Baseline period:6.3Evaluation period: 5.0**EP/BL:***P* = 0.49**Stillbirths, n (%):**Baseline period: 516 (2.8)Evaluation period:43 (2.4) |

1 A normal woman is a woman who is less likely to require intervention.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Althabe et al., 2004Country:Argentina, Brazil, Cuba, Guatemala, and Mexico System:36 hospitalsArgentina (18)Brazil (8)Cuba (4)Mexico (4)Guatemala (2)Baseline period:6 months baseline data; followed by 1 month staff training and implementation practice in intervention sitesEvaluation period:6 months use of the intervention in intervention sitesFunding:European Union, Pan American Health Organization, WHO and World Bank Special Programme of Research, multiple national contributions.**Author industry relationship disclosure:**None**Design:**Cluster randomized trial(hospitals matched by country, type of hospital, and baseline rates) | Cesarean reduction intervention:Implementation of policy of mandatory second opinion from person of equal or higher clinical qualifications to the attending physician. Consultations informed by use of evidence-based guidelines for reviewing cesarean birth indications.Groups:G1: InterventionG2: ControlN (hospitals) at randomization: G1: 18G2: 18N at baseline: G1: 17G2: 17 | Inclusion criteria: * Hospital baseline cesarean rate ≥ 15%
* Hospitals with > 1,000 births per year
* Able to implement protocol
* Successful completion of run-in period

Exclusion criteria: * See inclusion criteria
 | Births per year, n:Baseline: G1: 34,735G2: 39,175Evaluation: G1: 35,675G2: 39,638Parous, %: Baseline:G1: 62.2 G2: 66.5 **Medicaid:** Not applicable**Private insurance coverage:** Not applicable**Prior cesarean, %:**Baseline period:**G1:** 13.5 **G2:** 13.8  | Total providers/ staff: NRTotal providers/ staff formally trained: Not applicableSpecialty:NR**Compliance with second opinion, non-emergent cesarean, %:** 88 | **Mode of birth Vaginal, spontaneous:**NRVaginal, assisted, %:Baseline period: G1: 4.4G2: 2.8Evaluation period:G1: 4.9G2: 3.4G1/G2: *P* = 0.85Total cesarean births, %:Baseline period:G1: 26.3 G2: 24.6 Evaluation period:G1: 24.7G2: 24.9G1/G2: *P* = 0.044**Maternal outcomes****Maternal mortality, rate per 10,000 live births:** Baseline period:**G1:** 3.2**G2:** 5.9Evaluation period:**G1:** 4.3**G2:** 7.5**Neonatal outcomes Neonatal mortality, mean rate:**Baseline period:**G1:** 1.1 **G2:** 1.1 Evaluation period:**G1:** 0.9**G2:** 1.0**G1/G2:** *P* = 0.756**Perinatal mortality, mean rate:**Baseline period:**G1:** 2.6**G2:** 2.8 |
| Althabe et al., 2004 (continued) |  |  |  |  | Evaluation period:**G1:** 2.4**G2:** 2.9**G1/G2:** *P* = 0.273Apgar score:NRNICU admission, mean rate:Baseline period:G1: 8.4G2: 8.1Evaluation period:G1: 8.0G2: 8.3G1/G2: *P* = 0.340 |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Berglund et al., 2010Country:UkraineSystem:Three maternity units:1 **S1:** Donetsk **S2:** Lutsk **S3:** Lviv Baseline period:S1: 4 months prior to trainingS2: 4 months priorS3: 2 months priorEvalutation period:S1: 05/2004 to 12/2006S2: 05/2004 to 12/2006S3: 05/2004 to 11/2006Funding:WHO, national and university**Author industry relationship disclosure:**None**Design:**Pre-post assessment | Cesarean reduction intervention:National Mothers and Infant Health Project to train maternity staff and providers implemented in nine provinces. Detailed data collected at selected maternity sites.Training provided by a non-governmental organization (NGO) based on the WHO Making Pregnancy Safer tools and framework focused on implementation of evidence-based routines as standard care.Topics included:* Avoiding Induction
* Use of partograms
* Augmentation
* AROM
* Labor pain management
* Labor support
 | Inclusion criteria: NRExclusion criteria: NR | Births per year, n: Baseline period: S1: 652S2: 742S3: 3022004: S1: 1,021S2: 2,283S3: 1,7562005: S1: 1,720S2: 3,578S3: 2,8812006: S1: 1,820S2: 4,004S3: 2,590Last three month period: S1: 425S2: 998S3: 1,016Age, median yrs (range):Baseline period:S1: 24 (16-42)S2: 25 (14-44)S3: 22 (14-46)Evaluation period:S1: 25 (15-45)S2: 25 (15-48)S3: 23 (16-40)Parous, %: Primiparae:Baseline period:S1: 52.0S2: 47.4S3: 49.7Evaluation period:S1: 65.0S2: 51.8S3: 58.6**Medicaid:** Not applicable**Private insurance coverage:** Not applicable | Total providers/ staff, n: S1: 108S2: 171S3: 90Total providers/ staff formally trained, n (%): S1: 108 (100)S2: NR (36)S3: NR (49)**Specialty:**NR2 | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted, %:**Baseline period: S1: 3.7S2: 2.0S3: 0.0Evaluation period: S1: 0.0S2: 2.0S3: 0.0Cesarean birth, %:Baseline:S1: 30.0S2: 33.0S3: 22.0Total: 29.9\*Evaluation period:S1: 17.0S2: 12.3S3: 19.6Last three month period:S1: 18.4S2: 12.7S3: 16.9Total: 15.4\*S1/BL: *P* < 0.0001S2/BL: *P* < 0.0001S3/BL: *P* < 0.0606**Maternal outcomesMaternal mortality:** NR**Neonatal outcomes Early neonatal death, %:**Baseline period: **S1:** 13.6**S2:** 4.6**S3:** 6.4Evaluation period:**S1:** 10.9**S2:** 2.4**S3:** 1 |
| Berglund et al., 2010 (continued) |  |  |  |  | **Apgar score:**NR**NICU admission, %:**Baseline period: S1: 11.2S2: 7.3S3: 6.4Evaluation period: S1: 10.7S2: 4.3S3: 3.3S1/BL: *P* = 0.4153S2/BL: *P* = 0.0015S3/BL: *P* = 0.0015 |

\* Calculated by reviewer.

1 Three sites selected from among 20, method not reported.

2 Those trained included obstetricians, neonatologists, midwives, pediatricians, pediatric nurses, and anesthesiologists.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Bickell et al., 1996Dillon et al., 1992†Country:USSystem:New York State hospitalsS1: 45 reviewed hospitals **S2:** 120 non- reviewed hospitalsBaseline period:1988Evaluation period:1989 to 1990†1989 to 1993Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Task force developed guidelines for in-house peer review of obstetric care. Presented educational programs across the state to assist hospitals in implementation. Included a Dictionary of Terms to standardize terminology.External peer reviews by ACOG trained teams of 3-4 physicians and nurse. Reviewed 100 labor and delivery records to assess quality of care.Teams provided summary report to hospital for distribution to staff. Reviewed hospital was requested to provide implementation changes to Task Force 6-12 months later. | Inclusion criteria: * Participation was voluntary
* First 24 hospitals selected for geographic diversity by strata of cesarean section rates†
* Second set of hospitals randomly selected from those with high cesarean rates

Exclusion criteria: * See inclusion criteria
 | Births per year, mean (SE): Baseline period:S1: 1,430 (141.4)S2: 1,720 (125.9)Evaluation period:S1: 1,503 (152.8)S2: 1,720 (119.2)Hospitals by 1988 cesarean rate, n:< 20:S1: 8S2: 2520-24:S1: 3S2: 3025-29:S1: 11S2: 43≥ 30:S1: 23S2: 22**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:**NRVaginal, assisted:NRCesarean birth, mean rate (SE):Total:1988:S1: 29.1 (1.2)S2: 25.1 (0.5)S1/S2: *P* < 0.011993:S1: 25.8 (0.9)S2: 24.0 (0.4)S1/S2: *P* = NS1Change in total cesarean rate, by 1988 cesarean rate:< 20:S1: 2.5 (1.0) S2: 2.3 (0.7) 20-24:S1: -1.0 (2.5) S2: 0.0 (0.6) 25-29:S1: -2.4 (1.6) S2: -2.5 (0.6) ≥ 30:S1: -6.2 (0.9) S2: -3.8 (0.9) Repeat cesarean:1988:S1: 10.9 (0.5)S2: 9.8 (0.3) S1/S2: *P* = NS1993:S1: 24.8 (2.0)S2: 24.8 (1.1) S1/S2: *P* = NS**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomesNeonatal mortality:**NR |
| Bickell et al., 1996Dillon et al., 1992† (continued) |  |  |  |  | **Apgar score:**NR**NICU admission:**NR |

1 Although there was a significant crude difference in overall cesarean rate (P < 0.01), when 1988 cesarean rates were controlled for, there was no statistically significant impact of the intervention.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Boylan et al., 1991Country:USSystem:Hermann Hospital in Houston, TX (affiliated with the University of Texas)Baseline period:07/1/1984 to 06/30/1985Evaluation period:07/1/1985 to 06/30/1986Funding:NR**Author industry relationship disclosure:**NR**Design:**Pre-post assessment | Cesarean reduction intervention:Introduction of active management of labor (AML), including: AROM if laboring without SROM for more than two hours. IV oxytocin augmentation if dilation < 1 cm per hour. | **Inclusion criteria**:* Nulliparous women
* Singleton
* Vertex pregnancy
* Presenting in labor without fetal distress
* Labor defined by painful contraction at least every ten minutes with 80% efface-ment and 1 cm dilation.

Exclusion criteria: * See inclusion criteria
 | Births, n: Baseline period: 1,843Evaluation period: 2,057Age, mean yrs ± SD:Baseline period: First six months: 23.9 ± 5.1Last six months: 24.3 ± 5.1Evaluation period:First six months: 24.1 ± 5.3Last six months: 23.6 ± 5.4Race/ethnicity, %:Baseline period: First six months:White: 44.8Black: 36.6Hispanic: 13.1Other: 5.5Second six months:White: 47.8Black: 34.7Hispanic: 12.9Other: 4.5Evaluation period:First six months:White: 42.7Black: 39.7Hispanic: 14.1Other: 3.5Second six months:White: 39.3Black: 42.1Hispanic: 14.0Other: 4.6Parous, n: Total: 0**Medicaid:** NR | Total providers/ staff:10 obstetricians11 University of Texas faculty members5 autonomous private practitioners6 residents per year subervised by faculty Total providers/ staff formally trained: NR**Specialty:**NR(those trained included obstetricians, neonatologists, midwives, pediatricians, pediatric nurses, and anesthesi-ologists) | **Mode of birth Vaginal, spontaneous, n (%):**Baseline period: 735 (39.9)Evaluation period: 1,049 (51.0)**Vaginal, assisted, n (%):**Baseline period: 660 (35.8)Evaluation period: 621 (30.2)Cesarean birth, n (%):Baseline period: 448 (24.3)Evaluation period: 387 (18.8)EP/BL: Δ = 5.5 (95% CI: 2.9-8.1), *P* < 0.05Maternal outcomes**Maternal mortality:** NR**Neonatal outcomes Neonatal mortality, n (%):** Asphyxia:Baseline period: 1 (1.1)Evaluation period: 0Apgar score:NRNICU admissions, for asphyxia, n:Baseline period: 36Evaluation period: 37 |
| Boylan et al., 1991(continued) |  |  | **Private insurance coverage:** NR**Prior cesarean, n:****Total:** 0 |  |  |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Calvo et al., 2009Country:SpainSystem:Two public maternity hospitals: **S1:** Son Llàtzer **S2:** Menorca Baseline period:01/2006 to 06/2006Evaluation period:11/2006 to 04/2007Funding:NR**Author industry relationship disclosure:**None**Design:**Pre-post assessment | Cesarean reduction intervention:Using a consensus policy for cesarean indications in a multifaceted feedback program.Program included:weekly “debate” of cesareans performed in clinical meetings; appropriateness review of all cesareans every two months; dissemination of results, and introduction of methods for improvement by the units. | Inclusion criteria: NR1Exclusion criteria: NR | Births:NR**Medicaid:** All public patients**Private insurance coverage:** Not applicable | Total providers/ staff: NRTotal provider/ staff formally trained:NRSpecialty:NR  | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted:** NRCesarean birth, %:Baseline period: S1: 17.5S2: 29.0Evaluation period: S1: 15.8S2: 22.0S1/BL: *P* = NSS2/BL: *P* = NS Appropriate by study criteria, %:Baseline period: S1: 68.3S2: 80.0Evaluation period: S1: 84.3S2: 92.0S1/BL: *P* < 0.05S2/BL: *P* < 0.05 Maternal outcomes**Maternal mortality:** NR**Neonatal outcomes****Neonatal mortality:**NR**Apgar score:**NR**NICU admission:** NR |

1 Voluntary participation based on positive results at similar regional hospitals.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Elferink-Stinkens et al., 2004Country:NetherlandsSystem:85 of 116 Dutch obstetric departments participating in national databaseBaseline period:1994Evaluation period: 04/1995 to 09/1998 Funding:Praeventiefonds Nederland**Author industry relationship disclosure:**NR**Design:**RCT with hospitals stratified by size of department, academic vs. non-academic status, and initial cesarean rates | Cesarean reduction intervention:Report contextualizing departmental data in tabular and graphic form including:* No spontaneous onset (induction or planned cesarean)
* Planned cesarean
* No spontaneous birth (vacuum, forceps, or cesarean)
* Cesarean

Data also subdivided by very preterm, preterm, term, and postterm.1995 sent to depart-ment contacts for distribution; 1996 through 1998 sent to individual obstetricians within the intervention departments. Mailing followed up with repeat report and brief question-naire shortly after first mailing.Groups:**G1:** Intervention**G2:** Control | HospitalsInclusion criteria: * Participation in national perinatal database
* Medical ethics committee approval for newborn follow-up exams

Exclusion criteria: * Data excluded in a case of merger of intervention and control departments

**Infants**1% random sample of births obtained by contacting four randomly selected hospitals per day and sampling as below for new-born neurological exam**Inclusion criteria:*** All 32 - < 37 week births
* 50% of term births
* All ≥ 42 weeks
* Maternal consent

**Exclusion criteria:*** Less than 32 weeks at birth
 | Births:NRNeonatal examinations, n:Baseline period:32 - < 37 weeks:G1: 78G2: 11637 - < 42 weeks:G1: 406G2: 425≥ 42 weeks:G1: 59G2: 47Evaluation period:32 - < 37 weeks:G1: 130G2: 13037 - < 42 weeks:G1: 575G2: 554≥ 42 weeks:G1: 85G2: 88**Medicaid:** Not applicable**Private insurance coverage:** Not applicable | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:**NRVaginal, assisted: NRTotal cesarean births, % range:Total: 10 to 31G1/G2: *P* = NS**Maternal outcomes****Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:**NR**Apgar score:**NR**NICU admission:**NRAbnormal neurological exam, %:Baseline period:32 - < 37 weeks:G1: 17.9G2: 23.337 - < 42 weeks:G1: 13.1G2: 19.8≥ 42 weeks:G1: 22.0G2: 6.4Evaluation period:32 - < 37 weeks:G1: 26.9G2: 24.637 - < 42 weeks:G1: 13.2G2: 10.3≥ 42 weeks:G1: 5.9G2: 19.3**G1/G2:** OR = 1.3 (95% CI: 0.89-2.00) |

The spread of the cesarean rates between hospitals (as measured by the mean distance of the percentiles to the median) was significantly (7%) lower in the intervention group for term births (37 to 42 weeks). The difference in the spread was not significant for other gestational ages.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Gilstrap et al., 1984Country:USSystem:Wilford Hall Medical CenterBaseline period:1974 to 1977Evaluation period: 1978 to 1981Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Preliminary review of cesarean section policy in 1976, with special regard to the most common indications. Informal criteria and policies were established and directed toward assuring an adequate trial of labor, or ensuring fetal distress was persistent and ominous, and toward using established criteria to allow selected term frank breech presentations a trial at vaginal delivery. Assessment included mandatory intrauterine pressure monitoring with oxytocin usage and selected usage of scalp pH determinations.  | Inclusion criteria: NRExclusion criteria: NR | Total births, n: Baseline period: 6,693Evaluation period: 6,162Parity, women delivered by cesarean section, n (%): Primigravidas:Baseline period: 633/1,125 (56)Evaluation period: 469/940 (50)**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted, %:Baseline period: 6.7Evaluation period: 6.1Cesarean birth, n (%):\*Total:Baseline period: 1,125 (16.8)Evaluation period: 940 (15.2)EP/BL: *P* < 0.02Primary:Baseline period: 855\*\* (12.8)Evaluation period: 592\*\* (9.6)EP/BL: *P* < 0.0001Repeat:Baseline period: 270 (4.0)Evaluation period: 348 (5.6) EP/BL: *P* < 0.0001**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:**NR**Apgar score:**NR**NICU admissions:**NR |

\* The total, primary, and repeat cesarean rates by year from 1970 to 1981 are only displayed graphically.

\*\* Calculated by reviewer.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Gregory et al., 1999Country:USSystem:Cedars Sinai Medical CenterBaseline period:04/1993 to 12/1993Evaluation period: 1994 to 1998Funding: NRAuthor industry relationship disclosure: NR**Design:**Prospective observational | Cesarean reduction intervention:17 sequential interventions at the administrative, clinical education, and clinical protocol/guidelines levels | Inclusion criteria: NRExclusion criteria: NR | Births per year, n: Baseline: 5,1341994: 6,9601995: 6,9871996: 6,5281997: 6,5951998: 6,427Age, mean yrs ± SD:Baseline: 29.61 ± 6.21994: 29.4 ± 6.31995: 29.4 ± 6.31996: 29.7 ± 6.21997: 29.9 ± 6.31998: 30.1 ± 6.3**Race/ethnicity, %:**Caucasian:Baseline: 471994: 451995: 431996: 451997: 461998: 46Latina:Baseline: 191994: 191995: 191996: 201997: 201998: 21African American:Baseline: 251994: 271995: 261996: 271997: 251998: 24Other:Baseline: 91994: 81995: 121996: 91997: 91998: 9**Medicaid, %:** Baseline: 151994: 171995: 181996: 17 | Total providers/ staff: 9 full-time faculty 100 private physicians with obstetrical privilegesTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NR**Vaginal, assisted**:NR**Cesarean birth, %:**Baseline: 26.0 1994: NR1995: NR1996: NR1997: 20.51998: NRPost evaluation: 23.5**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomesNeonatal mortality:** NR**Apgar score:**NR**NICU admission:**NR |
| Gregory et al., 1999 (continued) |  |  | 1997: 161998: 16**Private insurance coverage:** Baseline: 101994: 61995: 31996: 31997: 21998: 2 |  |  |

1 Mean age reported as 19.6 at baseline, apparently in error as the change in mean age was not mentioned among those that were statistically significant.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Hamilton et al., 2004Country:US and CanadaSystem:Seven university hospitalsBaseline period:12/1/1998 to 01/30/1999Evaluation period:02/1/1999 to 03/31/2001Funding:NR**Author industry relationship disclosure:**NR**Design:**RCT and Pre-post assessment | Cesarean reduction intervention:Computer assistance in evaluation of labor progress. Output given to providers in the intervention group of the RCT displayed individuallabor curve plotted with addition of reference ranges (95th, 50th, and 5th percentile) that take into account contraction frequency, parity, and epidural use. Groups:**G1:** Intervention**G2:** ControlN at randomization: G1: 2,478G2: 2,515 | Inclusion criteria: * Nulliparous

Exclusion criteria: * See inclusion criteria
 | Births, n: Baseline period: Total: 5,753Evaluation period: Total: 4,993 (RCT participants)**Parous, %:**Primaparous: **Total:** 100**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, n (%):**Evaluation period: **G1:** 2,038 (82.3)**G2:** 2,089 (83.1)**G1/G2:** *P* = 0.53**Vaginal, assisted:** NRCesarean birth, n (%):Evaluation period:G1: 436 (17.6)G2: 425 (16.9)G1/G2: *P* = 0.53Cesarean rates, eligible women at all hospitals, n (%):Baseline period: Total: 1,124/5,753 (19.5)Evaluation period, 6th month: Total: 551/3,234 (17.0)EP/BL: *P* = 0.004Evaluation period, 12th month: Total: 923/5,554 (16.6)EP/BL: *P* = 0.0006**Maternal outcomes****Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:**NR**Apgar score, 5 minutes, n (%):**Evaluation period:0-2:**G1:** 7 (0.3)**G2:** 8 (0.3)3-4:**G1:** 5 (0.2)**G2:** 4 (0.2)5-6:**G1:** 37 (1.5) |
| Hamilton et al., 2004 (continued) |  |  |  |  | **G2:** 35 (1.4)7-8:**G1:** 186 (7.5)**G2:** 201 (8.0)9-10:**G1:** 2,239 (90.5)**G2:** 2,261 (90.1)**NICU admission:** NR |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Iglesias et al., 1991Country:CanadaSystem:Hinton General Hospital, Alberta(44 bed community hospital)Baseline period:01/1985Evaluation period: 01/01/1985 to 12/31/1989Funding: Hinton General Hospital, George Cedric Metcalf Charitable FoundationAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Guidelines from National Consensus Conference on Aspects of Cesarean Birth (NCCACB) for VBAC, manage-ment of breech presentation and diagnosis of dystocia requiring cesarean introduced at hospital in 1985.Cesarean section rate discussed annually at grand rounds. Consultation mandatory before primary cesarean section but not before a repeat section. | Inclusion criteria: * All births at the hospital from 01/01/1985-12/31/1989

Exclusion criteria:* See inclusion criteria
 | Births, n: Nulliparous:1985: 2371986: 2271987: 2181988: 2371989: 242Parous, n (%):Nulliparous:1985: 102 (43.0)1986: 91 (40.1)1987: 90 (41.3)1988: 84 (35.4)1989: 89 (36.8)**Medicaid:** Not applicable**Private insurance coverage:** NRPrior cesarean, n (%):11985: 27 (11.3)1986: 28 (12.3)1987: 24 (11.0)1988: 25 10.5)1989: 33 (13.6) | Total providers/ staff:2 Total: 12 (4 performed cesareans)Total providers/ staff formally trained: NR**Specialty:**Family physicians that all practice obstetrics, and several that are trained in anesthesia and surgery | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean birth, n (%):Total:1985: 55 (23)1986: 43 (19)1987: 38 (17)1988: 37 (16)1989: 31 (13)EP/BL: *P* = 0.001Nulliparous:1985: 23 (23)1986: 19 (21)1987: 21 (23)1988: 14 (17)1989: 11 (12) EP/BL: *P* = 0.0693**Maternal outcomes** **Maternal mortality n:** **Total:** 0**Neonatal outcomes** **Neonatal mortality, n (%):****Total:** 1 (0.09)**Apgar score:**NRNeonatal transfer, n: Total:1985: 3 (1.3)1986: 5 (2.2)1987: 4 (1.8)1988: 6 (2.5)1989: 2 (0.8) |

1 Includes only the women who were eligible for VBAC.

2 Medical staff started with nine physicians. During the study period two physicians left and three joined the staff.

3 The decreased cesarean rate for nulliparous women was due to a drop in the number that were dystocia-related.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Kazandjian and Lied, 1998Country:US, Canada, UK, and JapanSystem:Maryland’s Quality Indicator (QI) Project member hospitalsS1: 110 hospitals (continuously reporting) S2: 957 hospitals (non-continuous reporting)Baseline period:1991Evaluation period: 1992 to 1996Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:QI Project: continuous reporting of total, primary, and repeat cesarean section rates. | Inclusion criteria: * Hospitals participating in the QI Project
* Continuous reporting of cesarean measures for 24 quarters of 6 years

**Exclusion criteria:** * Joining QI Project late in the evaluation period
* Failure to report cesarean measures continuously
 | Births per year, most recent fiscal year, mean ± SD: S1: 1,427 ± 1,287S2: 1,238 ± 1,311S1/S2: *P* = 0.16**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous**: NRVaginal, assisted:NRCesarean birth, mean % ± SD:Total:1991: S1: 22.5 ± 7.1S2: 21.2 ± 7.81992: S1: 21.7 ± 6.0 S2: 21.2 ± 7.41993: S1: 20.9 ± 6.0S2: 21.3 ± 7.41994: S1: 20.0 ± 5.5S2: 21.2 ± 6.71995: S1: 19.3 ± 5.4S2: 21.0 ± 6.91996: S1: 19.4 ± 5.2S2: 20.7 ± 6.6ANOVA: YearS1: *P* < 0.001S2: *P* = NSPrimary:1991: S1: 15.8 ± 6.2S2: 15 ± 7.21992: S1: 15.3 ± 4.8 S2: 15.1 ± 6.61993: S1: 14.6 ± 4.9S2: 15.1 ± 6.71994: S1: 14.2 ± 4.4S2: 14.7 ± 5.51995: S1: 14.1 ± 5.9S2: 14.8 ± 5.71996: S1: 13.9 ± 4.2S2: 14.6 ± 5.5 ANOVA: YearS1: *P* < 0.001S2: *P* = NS |
| Kazandjian and Lied, 1998 (continued) |  |  |  |  | Maternal**outcomesMaternal mortality:** NR**Neonatal outcomesNeonatal mortality:** NR**Apgar score:**NRNICU admission: NR |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Kiwanuka and Moore, 1993Country:UKSystem:Central Manchester Health District **S1:** Saint Mary’s Hospital**S2:** Other hospital in district or home confinement Baseline period:1982Evaluation period: 1986Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Audit and feedback of specific information, imparted in a non-directive way to resident obstetricians at Saint Mary’s Hospital responsible for performing cesarean sections.  | Inclusion criteria: * Women resident in the Central Manchester Health District who delivered in 1986

Exclusion criteria: * See inclusion criteria
 | Births per year, n:1982: Total: 1,8951986: S1: 1,881S2: 327Total: 2,216**Parous, n:**Primigravidas at term:1986:**S1:** 703**S2:** 219**Medicaid:** Not applicable**Private insurance coverage:** Not applicablePrior cesarean, n:1986: 128 | Total providers/ staff: Resident obstetriciansTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean birth, n (%):1982:Total: 302 (15.9)1986:S1: 230 (12.2)S2: 51 (15.6)Total: 281 (12.7)EP/BL: *P* < 0.005Primagravidas at term:1986:S1: 82 (11.7)S2: 19 (14.7)**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:** NR**Apgar scores:**NR**NICU admissions:**NR |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Lagrew and Morgan, 1996Country:USSystem:Saddleback Memorial Medical CenterBaseline period: Evaluation began in 1988Evaluation period: 05/15/1988 to 06/30/1994Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post analysis | Cesarean reduction intervention:Clinic guideline changes including oxytocin administration for induction and augmentation of labor, cervical ripening protocols, education of nursing staff in active labor management and evaluation of fetal monitoring. Prenatal VBAC class. | Inclusion criteria: NRExclusion criteria: NR | Births, n: 1988: 70511989: 1,6001990: 2,2541991: 2,2731992: 2,2481993: 1,9341994: 1,0051Age, n (%):≤ 19 years:1998: 16 (2.3) 1989: 51 (3.2)\*1990: 83 (3.5)\*1991: 88 (3.9)\*1992: 67 (3.0)\*1993: 61 (3.1)\*1994: 50 (4.9) ≥ 35 years:1998: 103 (14.6)1989: 251 (15.7)\*1990: 346 (14.7)\*1991: 353 (15.5)\*1992: 367 (16.3)\*1993: 277 (14.3)\*1994: 162 (16.1)Nulliparous,n (%): 1998: 328 (46.6)1989: 778 (48.6)\*1990: 1,186 (50)\*1991: 1,111 (48.9)\*\*1992: 1,048 (46.6)\*\*1993: 961 (49.7)\*1994: 485 (48.3)**Medicaid:** Low incidence of Medicaid deliveries**Private insurance coverage:** NRMultiple gestations, n (%):1988: 11 (1.6)1989: 26 (1.6)\*1990: 38 (1.6)\*1991: 39 (1.7)\*1992: 47 (2.1)\*  | Total providers/ staff: NRTotal providers/ staff formally trained: NursesPhysicians**Specialty:**NR | **Mode of birth Vaginal, spontaneous:**NRVaginal, assisted:NRCesarean birth, %: Total:1988: 31.11989-1993: NR\*\*1994: 15.4EP/BL: *P* < 0.000001 Primary:1988: 17.91989-1993: NR\*\*1994: 9.8EP/BL: *P* < 0.000001 Repeat:1988: 13.21989-1993: NR\*\*1994: 5.7EP/BL: *P* < 0.000001Nulliparous:1988: 28.11989-1993: NR\*\*1994: 16.9EP/BL: *P* < 0.00001**Maternal outcomes Maternal mortality:** NR**Neonatal outcomes** Neonatal mortality, deaths per 1000 live births, n (%):1988: 3 (4.26)1989: 1 (0.63)1990: 3 (1.34)1991: 5 (2.20)1992: 6 (2.67)1993: 4 (2.07)1994: 2 (2.0)Apgar score < 7, 5 minutes, n:1988: 15 (2.1)1989: 27 (1.7)\* |
| Lagrew and Morgan, 1996 (continued) |  |  | 1993: 34 (2.3)\*1994: 15 (1.5) |  | 1990: 53 (2.3)\* 1991: 37 (1.6)\* 1992: 46 (2.1)\*1993: 48 (2.5)\*1994: 21 (2.1)NICU admission:NRStillbirths, n (%):(deaths per 1000 births)> 500 gm:1988: 2 (1.42)1989: 2 (1.25)1990: 9 (3.11)1991: 3 (1.32)1992: 5 (1.78)1993: 6 (2.07)1994: 6 (2.99) |

\* Calculated by reviewer.

\*\* Results only displayed graphically.

1 The evaluation period included 7.5 months in 1988 and 6 months in 1994.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Liang et al, 2004Country:TaiwanSystem:Taipei Veterans General Hospital1Baseline period: 1993 to 1996Evaluation period: 1997 to 2000Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Established a cesarean surveillance system, held weekly departmental cesarean indication conferences to review data for all cesarean sections. Required second opinion from consultant obstetrician for all cesarean sections. Physician’s section rates presented at conference.Guidelines for dystocia, fetal distress and breech were unchanged from 1993-2000. | Inclusion criteria: * One low transverse uterine scar
* Singleton pregnancy
* Vertex presentation
* No medical or surgical illness
* Patient consent

Exclusion criteria: * No food or drink was allowed until the baby was born
 | Births, n:Baseline period: 9,864 Evaluation period: 7,9371997: 2,082 1998: 1,776 1999: 1,928 2000: 2,151**Medicaid:** NR**Private insurance coverage:** NRPrior cesarean, n:Evaluation period: 1,169 1997: 328 1998: 280 1999: 264 2000: 297  | Total providers/ staff: NRTotal providers/ staff formally trained: 2 board certified-obstetricians**Specialty:**ObstetricsPediatricians | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean births, n (%):2 Total:Baseline period: 3,647 (37) Evaluation period: 2,436 (30.7) EP/BL: *P* < 0.001Primary:Baseline period: 2,099 (21.3) Evaluation period: 1,412 (17.8) EP/BL: *P* < 0.001 Repeat:Baseline period: 1,548 (15.7) Evaluation period: 1,024 (12.9) EP/BL: *P* < 0.001**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:** NR**Apgar scores:**NR**NICU admissions:**NR |

1 Authors also present data for the entire country.

2 Total, primary, and repeat cesarean rates are reported for each year from 1993 to 2000.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Maher et al., 1994Country:AustraliaSystem:Toowoomba Base HospitalBaseline period:1991 to 1992Evaluation period: 1992 to 1993Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:In July 1992, active management of labor protocol andsystematically incorporating VBAC into the management of previous-cesarean patients in the resident service.Rigorous peer review. | Inclusion criteria: NRExclusion criteria: NR | Births, n: Baseline period: 1,112Evaluation period: 1,167**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean birth, n (%):Total:Baseline period: 228 (20.6)Evaluation period: 129 (11.0) EP/BL: OR = 0.48 (95% CI: 0.37-0.59), *P* < 0.0001Elective:Baseline period: 107 (9.6)Evaluation period: 59 (5.0) EP/BL: OR = 0.50 (95% CI: 0.34-0.66), *P* < 0.0001Emergency:Baseline period: 121 (10.9)Evaluation period: 70 (6.0) EP/BL: OR = 0.52 (95% CI: 0.36-0.68), *P* < 0.0001**Maternal outcomesMaternal mortality:** NR**Neonatal outcomes Neonatal mortality, n (%):** Baseline period: 5 (0.4)Evaluation period: 8 (0.7)**Apgar score ≤ 7, 5 minutes, n:**Baseline period: 93Evaluation period: 61 |
| Maher et al., 1994(continued) |  |  |  |  | **NICU admissions:**NR**Stillbirths, n (%):**Baseline period: 8 (0.7)Evaluation period: 8 (0.7) |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Main, 1999Country:USSystem:**S1:** Children’s Hospital of San Francisco (1980-1995)S2:1 Pacific Presbyterian Medical Center; (control group from 1989-1992; intervention from 1992-1995)Baseline period:1980 to 1988Evaluation period: 1989 to 1995Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Intensive outcomes feedback using a computerized information system. First 3 years: daily reports and coded group comparison statistics at depart-ment meetings. Those in worst quartile were bolded, and guidance provided on how to “be like” the best quartile. Starting in 1993, “open label” feedback: intra-departmental release of everyone’s key statistics with names. Computer algorithm introduced to review the electronic portion of cesarean births records. Standardized nuliparous and multiparous cesarean birth rates reported to facilitate comparisons between individual providers. | Inclusion criteria: NRExclusion criteria: NR | Births per year, 1980s, range: S1: 3,200 to 3,600S2: NR**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**Obstetrics | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean birth, %:Baseline period:Total:\* 23 to 251989:S1: NR\*S2: NR\*1990:S1: NR\*S2: NR\*1991:S1: 20.7S2: 25.11992:S1: NR\*S2: 24.61993: S1: NR\*S2: 20.31994: Total: 18.31995: Total: 18.1Primary cesarean:Baseline period:S1: 15.6 to 16.9S2: 15.2 to 17.8Post evaluation:Total: 13.6Repeat cesarean:Baseline period:S1: 8.0 to 8.6S2: 6.8 to 8.1Post evaluation:Total: 4.4**Maternal outcomes Maternal mortality:** NR**Neonatal outcomesNeonatal mortality:** NR**Apgar score:**NR |
| Main, 1999 (continued) |  |  |  |  | **NICU admissions:**NR |

1 In 1987, three groups of obstetricians left the Children’s Hospital of San Francisco and opened a new obstetric service at Pacific Presbyterian Medical Center. In 1993, the two hospitals rejoined with a single obstetric unit.

\*Data only presented graphically.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Myers and Gleicher, 1988Myers and Gleicher, 1993†Country:USSystem:Mount Sinai Hospital Medical CenterBaseline period:1985Evaluation period: 1986-19871987-1991†Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Stringent implementation of existing departmental guidelines and implementation of new ones, including (1) a second opinion, (2) philosophy that vaginal delivery was preferred for those who had prior cesarean, (3) diagnosis of dystocia required no progress of labor with contractions of appropriate strength by intrauterine pressure catheter, (4) fetal distress, based on monitoring of the fetal heart rate, had to be corroborated by sampling of blood from the fetal scalp when feasible, (5) vaginal birth recommended for most breech fetuses, (6) comprehensive peer review of adherence to guidelines.All attending physicians were informed of their personal cesarean rates at quarterly intervals, and were told whether they were within two SD of the departmental rate. | Inclusion criteria: NRExclusion criteria: NR | Births per year, n:11985: 1,6971986: 2,1011987: 2,3011988: 2,340†1989: 2,688†1990: 2,817†1991: 3,218†**Parous, n (%):**Primigravidae:1985: 399 (22.9)1986: 606 (28.8)1987: 683 (29.7)1988: 761 (31.3)†1989: 806 (29.9)†1990: 785 (27.8)†1991: 941 (29.2)†**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: Teaching service supervised by full-time faculty and private attending physiciansTotal providers/ staff formally trained: NR**Specialty:**Obstetricians and perinatology staff | **Mode of birth Vaginal, spontaneous, n (%):**1985: 1,223 (72.1)1986: 1,685 (80.2)1987: 1,937 (82.1) **EP/BL:** *P* < 0.051988: 1,997 (82.1)†1989: 2,262 (84.1)†1990: 2,431 (84.8)†1991: 2,756 (85.6)†Vaginal, assisted, n (%):1985: 177 (10.4)1986: 154 (7.3)1987: 99 (4.3)EP/BL: *P* < 0.051988: 78 (3.1)†1989: 73 (2.6)†1990: 79 (2.7)†1991: 76 (2.4)†Cesarean birth, n (%):Total:1985: 297 (17.5)1986: 262 (12.5)1987: 265 (11.5) EP/BL: *P* < 0.051988: 298 (12.2)†1989: 279 (10.3)†1990: 293 (10.4)†1991: 382 (11.9)†Primary:1985: 204 (12)1986: 175 (8.3)1987: 156 (6.8) EP/BL: *P* < 0.05Repeat:1985: 93 (5.5)1986: 87 (4.1)1987: 109 (4.7) EP/BL: *P* < 0.05Cesarean birth, teaching staff, %:1985: 15.01986: 11.01987: 11.7EP/BL: *P* < 0.05 |
| Meyers and Gleicher, 1988Meyers and Gleicher, 1993 (continued) |  |  |  |  | Cesarean birth, private staff, %:1985: 20.01986: 15.01987: 12.4**EP/BL:** *P* < 0.05**Maternal outcomes** **Maternal mortality:** A single maternal death occured in 1986**Neonatal outcomes Neonatal mortality, n (%):2**1985: 22 (12.8)1986: 23 (10.7)1987: 26 (11.2)1988: 18 (10.7)†1989: 29 (14.5)†1990: 46 (16.0)†1991: 29 (9.0)†Apgar score, 5 minutes, n (%):< 7:1985: 501986: 82 (3.8)1987: 116 (4.9)1988: 70 (2.8)†1989: 54 (1.9)†1990: 62 (2.1)†1991: 57 (1.7)†< 3:1985: NR1986: 8 (0.5)1987: 17 (0.7)1988: 12 (0.4)†1989: 10 (0.3)†1990: 12 (0.4)†1991: 13 (0.4)†NICU admission:NR |

1 1985 data based on total deliveries; 1986 and 1987 data based on mothers giving birth

2 An analysis of birth weight specific neonatal mortality fails to demonstrate any statistical benefit from cesarean delivery.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Oleske et al., 1992Country:USSystem:Illinois hospitals1986 to 1987: 198 hospitals1988: 187 hospitalsBaseline period: 1985Evaluation period: 1986 to 1988Funding: Partial from Illinois Health Care Cost Containment CouncilAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Illinois Health Care Cost Containment Council (IHCCCC) distributed information to patients and providers on average hospital charge, average length of stay and cesarean birth rate in each hospital. Over 50,000 informational brochures distributed annually. Also annual press releases to media on state-wide cesarean birth patterns.  | Inclusion criteria: * Non-federal, short-stay hospital deliveries in Illinois (from hospital discharge abstract form for uniform billing)
* ICD9 codes 650-699, V27 or procedure codes 72-74
* Aged 10-50

Exclusion criteria: * See inclusion criteria
 | Births per year, n:1986: 130,249 1987: 147,257 1988: 167,654 **Age, mean yrs:**1988: 26.4 | Total providers/ staff: NRTotal providers/ staff formally trained: Council of Teaching Hospitals member**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean birth, %: Baseline period: 21.2 Evaluation period: 22.4EP/BL: *P* = NSCesarean birth rate by age, %:< 20:1986: 16.61987: 17.71988: 17.320-24:1986: 20.51987: 20.91988: 20.625-29:1986: 23.01987: 23.91988: 22.530-34:1986: 25.11987: 25.21988: 24.8> 35:1986: 27.71987: 28.81988: 28.7Cesarean birth rate by expected primary payer, %:Medicaid: 1986: 20.61987: 20.91988: 20.6Self-pay: 1986: 16.81987: 17.21988: 16.7Commercial: 1986: 23.81987: 24.31988: 23.9 |
| Oleske et al., 1992 (continued) |  |  |  |  | HMO:1986: 25.11987: 23.71988: 22.5**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:** NR**Apgar score:**NR**NICU admissions:**NR |

Subgroup analysis showed that the cesarean rate declined for women with a history of uterine scar or dystocia (*P* < 0.05), and increased for breech or fetal distress (*P* < 0.05).

The VBAC rate increased by 58.4% from 10.1 to 16.0 during the study (*P* < 0.001).

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Poma, 1998Country:USSystem:Ravenswood Hospital (Loyola University affiliated community hospital)Baseline period:1991 to 1993Evaluation period:1994 to 1996Funding:NR**Author industry relationship disclosure:**NR**Design:**Pre-post assessment | Cesarean reduction intervention:Departmental goal of 15% total cesarean rate supported by case review of cesareans using ACOG guidelines with feedback to individual providers. During this timeframe the departmental also implemented 24-hour in-hospital attending coverage. | Inclusion criteria: NRExclusion criteria: NR | Births, n: 1991: 2,2311992: 2,2591993: 2,3721994: 2,2391995: 2,0281996: 1,783Age, n (%):< 15:Baseline period: 6 (0.1)Evaluation period:12 (0.2)15-19:Baseline period: 1,109 (16.2)Evaluation period: 983 (16.2)20-35:Baseline period: 5,298 (77.2)Evaluation period 4,619 (76.4)36-40:Baseline period: 402 (5.8)Evaluation period:379 (6.3)> 40: Baseline period: 47 (0.7)Evaluation period:57 (0.9)Race/ethnicity, n (%):Hispanic:Baseline period: 3,430 (50.0)Evaluation period: 3,086 (51.0)Parous, n (%):Baseline period: 4,770 (69.5)Evaluation period: 4,142 (68.5) **Medicaid, n (%):** Baseline period: 3,280 (47.8)Evaluation period: 2,638 (43.6)  | Total providers/ staff:NRTotal providers/ staff formally trained: NR**Specialty:**NR  | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted, n (%):**Forceps:1Baseline period: 147 (2.1)Evaluation period:104 (1.7)Vacuum:Baseline period: 103 (1.5) Evaluation period:212 (3.5)EP/BL: *P* < 0.001Cesarean, n (%):Total:1991: 518 (23.2)1992: 492 (21.8)1993: 535 (22.5)1994: 460 (20.5)1995: 379 (18.7)1996: 285 (16)EP/BL: *P* < 0.0012Total cesarean, %:Baseline period: 22.5Evaluation period:18.6EP/BL: *P* = 0.001Primary cesarean, %:1991: 13.8 1992: 13.41993: 13.41994: 11.21995: 10.81996: 9.7EP/BL: *P* < 0.0012Baseline period: 13.5Evaluation period:10.6EP/BL: *P* = 0.001Repeat cesarean, %:1991: 9.4 1992: 8.4 1993: 9.1 |
| Poma, 1998 (continued) |  |  | EP/BL: *P* = 0.0001Private insurance coverage, n (%):Baseline period: 1,277 (18.6)Evaluation period: 1,162 (19.2)EP/BL: *P* = 0.016**HMO, n (%):**Baseline period: 1,866 (27.2)Evaluation period: 1,791 (29.6)EP/BL: *P* = 0.002Prior cesarean, n (%):Baseline period: 617 (39.9)Evaluation period: 481 (42.8) |  | 1994: 9.31995: 7.91996: 6.3EP/BL: *P* < 0.0012Baseline period: 9.0Evaluation period:7.9EP/BL: *P* = 0.03**Maternal outcomesMaternal mortality:** NR**Neonatal outcomesNeonatal mortality, n (%):**Baseline period: 25 (3.6)Evaluation period: 14 (2.3)**Apgar score < 7, %:**1 minute:Baseline period: 4.3Evaluation period: 5.0 **EP/BL:** *P* = 0.085 minutes:Baseline period: 1.5Evaluation period: 1.2 **EP/BL:** *P* = 0.12**Neonatal admissions, n (%):**Baseline period: 106 (1.5)Evaluation period:85 (1.4) |

1 One mid-forceps delivery

2 First compared to last year

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Porreco, 1990Country:USSystem:Eight hospitals in the Denver metropolitan areaBaseline period:Intervention began in 1982Earliest data: 1984Evaluation period:1986Funding:NR**Author industry relationship disclosure:**NR**Design:**Pre-post assessment | Cesarean reduction intervention:Five year community education strategy initiated in 1982 designed to reach:physicians, nurses, and interested lay group with educational presentations about:1) management of patients with prior cesarean; 2) diagnosis and management of fetal distress in labor, 3) indications and strategies for labor induction, 4) approach to failed progress in labor; 5) alternative management of breech and twin births; 6) increasing risk-free interval for women with genital herpes  | Inclusion criteria: * Hospitals with ≥ 1,500 births per year

Exclusion criteria: * See inclusion criteria
 | Births, n: 1984: 22,6241986: 23,642**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff:NRTotal providers/ staff formally trained: NR1**Specialty:**NR  | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted:**NRCesarean, %:Total: 1984: 17.31986: 19.3Primary:1984: 11.81986: 13.7Repeat:1984: 5.51986: 5.6Maternal outcomes**Maternal mortality:** NR**Neonatal outcomes****Neonatal mortality:**NR**Apgar score:**NR**NICU admission:**NR |

1 30 presentations to physicians, 22 presentations to nurses and health professionals, and 15 presentations to community organizations.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
| --- |
| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Pridjian et al., 1991Country:USSystem:Chicago Lying-In HospitalBaseline period:1982Evaluation period: 1983 to 1988Funding: Mother’s Aid Research Fund, Chicago Lying-In HospitalAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Systematically incorporating VBAC into the management of previous-cesarean patients in the resident service. | Inclusion criteria: NRExclusion criteria: NR | Births per year, n: 1982: 2,8271983: 3,0091984: 2,9191985: 2,6121986: 2,5551987: 2,8401988: 3,049Age ≥ 35 years, %:1982: 5.61983: 5.71984: 5.31985: 6.21986: 6.31987: 5.61988: 6.4Χ2: *P* = 0.515Race/ethnicity, %:Black:1982: 91.01983: 93.01984: 90.01985: 87.71986: 89.31987: 89.91988: 86.6Χ2: *P* < 0.001Parous, %: Primaparous:1982: 34.21983: 38.41984: 38.81985: 39.11986: 38.71987: 39.21988: 39.9Χ2: *P* < 0.001**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: 20 residents, 6 faculty members and 2 fellowsTotal providers/ staff formally trained: NR**Specialty:**Maternal-fetal medicine | **Mode of birth Vaginal, spontaneous:** NRVaginal, operative, %:1982: 15.71983: 14.51984: 14.71985: 13.11986: 14.21987: 11.91988: 10.2Cesarean birth, %:Total:1982: 12.51983: 14.71984: 16.11985: 17.11986: 17.61987: 17.01988: 15.9EP/BL: *P* < 0.001\*Primary:1982: 7.51983: 8.81984: 9.91985: 10.21986: 11.91987: 11.51988: 10.6EP/BL: *P* < 0.001\*Repeat:1982: 5.01983: 5.91984: 6.21985: 6.91986: 5.71987: 5.51988: 5.3EP/BL: *P* = 0.776\***Maternal outcomesMaternal mortality:** NR**Neonatal outcomes Neonatal mortality:** NR**Apgar scores:** NR |
| Pridjian et al., 1991 (continued) |  |  |  |  | **NICU admission:**NR |

\* Logistic regression, with year as the independent variable.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Robson et al., 1996Country:UKSystem:Pembury HospitalBaseline period:1984 to 1988Evaluation period: 09/1989 to 08/1992Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Introduction and completion of the medical audit cycle. | Inclusion criteria: NRExclusion criteria: NR | Births, n: Baseline period:12,628Evaluation period:8,497Parous: Nulliparous:Baseline period:5,622Evaluation period:3,585Multiparous:Baseline period:7,006Evaluation period:4,912**Medicaid:** NR**Private insurance coverage:** NRMultiple gestations, n:Baseline period: 157Evaluation period:127 | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous**: NRVaginal, assisted:NRCesarean birth, n (%):Baseline period: 1,518 (12.0)Evaluation period: 1810 (9.5)Nulliparous:Baseline period: 744 (13.2)Evaluation period: 344 (9.6)Multiparous:Baseline period: 774 (11.0)Evaluation period: 466 (9.5)**Maternal outcomes Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:**NR**Apgar score:**NR**Admission rate to special care baby unit, spontaneous-ly laboring nulli-parous women with singleton, cephalic, n (%):** Baseline period: 169/3,977 (4.2)Evaluation period: 88/2,589 (3.4) |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Rust et al., 1993Country:USSystem:93rd Strategic Hospital at Castle Air Force Base, CaliforniaBaseline period:07/1987 to 06/1988Evaluation period:07/1988 to 06/1989Funding:NR**Author industry relationship disclosure:**NR**Design:**Pre-post assessment | Cesarean reduction intervention:Implemented protocols including:1) policy for VBAC, including counseling and encouraging trial of labor 2) policy for management of non-vertex presentation by external cephalic version3) protocol to document an adequate trial of labor4) established criteria for diagnosis and documentation of fetal distress | Inclusion criteria: * Delivery after 24 weeks gestation

Exclusion criteria: * See inclusion criteria
 | Births per year, n: Baseline period: 472Evaluation period:430 Parous, n (%): 1985: 1309 (77.1)1986: 1495 (71.2)1987: 1618 (70.3)**Medicaid:**NR**Private insurance coverage:** NR | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:****NR** | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted, n (%):**Baseline period: 27 (5.8)Evaluation period: 20 (4.7)Cesarean birth, n (%):Total:Baseline period: 99 (21.2)Evaluation period: 44 (10.3)EP/BL: *P* < 0.0001Primary:Baseline period: 59 (12.5)\*Evaluation period: 19 (4.4)\*EP/BL: *P* < 0.0001**Maternal outcomes:****Maternal mortality:**NRPostpartum hemorrhage, n (%):Baseline period: 10 (2.1)Evaluation period: 14 (3.3)**Neonatal outcomes Neonatal mortality:**NR**Apgar score:**NR**NICU admission:**NR |

\* Calculated by reviewer.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Sanchez-Ramos et al., 1990Country:USSystem:University Medical Center, Jacksonville FLBaseline period:1986Evaluation period: 1987 to 1989Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:New guidelines focused on intrapartum management of women with prior cesarean section.New guidelines were also introduced for:* Primary cesarean
* Induction
* Fetal scalp pH sampling
* Breech
* Twins
 | Inclusion criteria: NRExclusion criteria: NR | Births, n: 1986: 4,3361987: 4,2701988: 4,4701989: 5,157**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff: Resident physicians and nurse midwives, supervised by faculty membersTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted %:1986: 16.21989: 18.5Cesarean birth, n (%):Total:1986: 1,198 (27.5) 1987: 952 (22.4)1988: 598 (13.3)1989: 542 (10.5)EP/BL: *P* < 0.0001Primary:1986: 849 (19.5) 1987: 643 (15.0)1988: 424 (9.4)1989: 374 (7.2)EP/BL: *P* < 0.0001Repeat:1986: 349 (8.0) 1987: 319 (7.4)1988: 174 (3.9)1989: 168 (3.3)EP/BL: *P* < 0.0001Trial of labor, women with prior cesarean, n (%):1986: 139 (31.7) 1987: 193 (41.9)1988: 381 (76.5)1989: 487 (83.9)EP/BL: *P* < 0.0001VBAC, women with prior cesarean, n (%):1986: 90 (20.5) 1987: 142 (30.8)1988: 342 (65.1)1989: 403 (69.4)EP/BL: *P* < 0.0001**Maternal outcomes****Maternal mortality:** NR |
| Sanchez-Ramos et al., 1990 (continued) |  |  |  |  | Neonatal outcomes Neonatal mortality, per 1000 births, n (%):1986: 71 (16.4)1987: 41 (9.6)1988: 35 (7.8)1989: 33 (6.4)EP/BL: *P* < 0.001Perinatal mortality rate per 1000 births:1986: 31.81987: 19.71988: 17.41989: 14.9EP/BL: *P* < 0.0001Apgar score < 7, n (%):1 minute:1986: 457 (10.5)1987: 357 (8.4)1988: 476 (10.6)1989: 571 (11.0)5 minutes:1986: 79 (1.8)1987: 65 (1.5)1988: 83 (1.9)1989: 90 (1.7) NICU admission, n (%):1986: 447 (10.3)1987: 420 (9.8)1988: 432 (9.7)1989: 453 (8.8) NICU length of stay, days, mean:1986: 191987: 151988: 151989: 16 Neonatal seizures, n (%):1986: 108 (2.5)1987: 120 (2.8)1988: 116 (2.6)1989: 114 (2.2) |

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Sloan et al., 2000Country:EcuadorSystem:Maternidad Isidro Ayora (public hospital serving lower to middle income women)1**Baseline period:** 1995 to 04/1996Evaluation period: 05/15/1996 to 12/15/1996Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Implemented policy requiring “second opinion” from supervising obstetrician or resident for all cesarean candidates (excluding mandatory situations).Consultant obstetrician trained two senior physicians one of whom subsequently trained two more physicians.Groups:(among women for whom detailed data was collected2)G1: Co-managedG2: Not co-managedGa: Vaginal deliveryGb: Cesarean delivery | Inclusion criteria: * Co-managed deliveries

Exclusion criteria: * See inclusion criteria
 | Births, n:Evaluation period: Total: 7,381G1: 1,217G1a: 503G1b: 714G2: 367G2a: 1G2b: 366**Age, mean ± SD:**Evaluation period:**Total:** NR**G1a:** 22.6 ± 6.1**G1b:** 25.0 ± 6.3**G2b:** 25.4 ± 5.7**G1a/G1b:** *P* < 0.001**G1a/G2b:** *P* < 0.001**Parity, mean ± SD:**Evaluation period:**Total:** NR**G1a:** 0.75 ± 1.21**G1b:** 0.85 ± 1.25**G2b:** 1.01 ± 1.06**G1a/G2b:** *P* < 0.05**Medicaid:** NR**Private insurance coverage:** NRPrior cesarean, %:Evaluation period:Total: NR G1a: 10.7G1b: 29.3G2b: 55.2**G1a/G1b:** *P* < 0.001**G1a/G2b:** *P* < 0.001**G1b/G2b:** *P* < 0.001Multiple gestations, %: Evaluation period:Total: NR G1a: 0  | Total providers/ staff: NRTotal providers/ staff formally trained: Three trained obstetricians provided the mandatory second opinion during a six week period.**Specialty:**Obstetrics | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean births, mean % ± SD:Baseline period: 26.6 ± 4.4 Evaluation period: 22.1 ± 4.2 EP/BL: *P* < 0.001**Maternal outcomes** **Maternal mortality:** NR**Maternal postpartum infection/fever, %:G1a:** 1.0**G1b:** 5.2**G2b:** 4.6**G1a/G1b:** *P* < 0.001**G1a/G2b:** *P* < 0.001**Neonatal outcomes Neonatal mortality, %: Total:** 24**G1a:** 1.0 (n=501)**G1b:** 2.0 (n=712)**G2b:** 1.4 (n=363)**Apgar score < 7, 5 minutes, %:****G1a:** 1.4 (n=501)**G1b:** 2.5 (n=712)**G2b:** 2.5 (n=362)**NICU admissions, %:****G1a:** 10.4 (n=501)**G1b:** 20.8 (n=712)**G2b:** 18.2 (n=363)**G1a/G1b:** *P* < 0.001**G1a/G2b:** *P* < 0.001**Neonatal length of stay, mean days ± SD:G1a:** 3.37 ± 2.69 (n=499) |
| Sloan et al, 2000 (continued) |  |  | G1b: 0.4G2b: 0 |  | **G1b:** 4.57 ± 3.39 (n=709)**G2b:** 4.68 ± 4.07 (n=360)**Stillbirth, %:G1a:** 0.4**G1b:** 0.3**G2b:** 0.8 |

1 The paper also reports cesarean rates for other major maternity hospitals in Ecuador without the intervention.

2 2111 women were identified as candidates for cesarean sections. Data were not collected on 506 women for whom cesarean was considered mandatory, and on 21 women eligible for co-management but accidently not included.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Smith et al., 2000Country:USSystem:BryanLGH Medical Center, Lincoln, NEBaseline period:01/1998 to 06/1998Evaluation period:07/1998 to 01/1999Post-evaluation period:01/1999 to 03/1999Funding:NR**Author industry relationship disclosure:**NR**Design:**Pre-post assessment | Cesarean reduction intervention:Interdisciplinary team focused on educating nurses, physicians, and community about labor support measures.Electronic data performance measurement system adopted as part of hospital quality improvement activitiesQuality improve-ment team charged with decreasing total and primary cesarean ratesFeedback of individual cesarean data to physicians | Inclusion criteria: NRExclusion criteria: NR | Births: NR**Medicaid:** NR**Private insurance coverage:** NR | Total providers/ staff:NR Total providers/ staff formally trained: NR**Specialty:**NR  | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted:**NRCesarean birth, %:\*Baseline period: 27.0Evaluation period: 19.0Post-evaluation: 24.5EP/BL: *P* = NRMaternal outcomes**Maternal mortality:** NR**Neonatal outcomes Neonatal mortality:**NR**Apgar score:**NR**NICU admission:**NR |

\* Quarterly total and primary cesarean birth rates only presented graphically.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Socol et al., 1993Country:USSystem:Northwestern Memorial HospitalBaseline period:1986Evaluation period: 1987 to 19911Funding:NR**Author industry relationship disclosure:**NR**Design:**Pre-post assessment | Cesarean reduction intervention:1987 to 1988 vaginal birth after prior low transverse cesarean encour-aged; 1988 forward cesarean birth rate of each obstetrician circulated annually to attending obstetricians;RCT of active management of labor completed and protocol recommended for routine practice. | Inclusion criteria: * All providers and births included

Exclusion criteria:* See inclusion criteria
 | Births, n: 1986: 4,2401987: 4,2191988: 4,2711989: 4,3911990: 4,8291991: 4,669Race/ethnicity, n (%):White:1986: 2,718 (64.1)1987: 2,799 (66.3)1988: 2,759 (64.6)1989: 2,849 (64.9)1990: 3,031 (62.8)1991: 2,942 (63.0)Black:1986: 894 (21.1)1987: 850 (20.2)1988: 932 (21.8)1989: 916 (20.9)1990: 1,009 (20.9)1991: 888 (19.0)Other:1986: 628 (14.8)1987: 570 (13.5)1988: 580 (13.6)1989: 626 (14.2)1990: 789 (16.3)1991: 839 (18.0)Parous, n (%): 1986: 2,231 (52.6)1987: 2,250 (53.3)1988: 2,234 (52.3)1989: 2,310 (52.6)1990: 2,502 (51.8)1991: 2,426 (52.0)**Medicaid/ Indigent, n (%):** 1986: 1,330 (31.4)1987: 1,269 (30.1)1988: 1,235 (28.9)1989: 1,356 (30.9)1990: 1,446 (29.9)1991: 1,305 (28.0)**Private insurance coverage, n (%):** 1986: 2,910 (68.6)1987: 2,950 (69.9)1988: 3,036 (71.1)1989: 3,035 (69.1)1990: 3,383 (70.1) | Total providers/ staff: Private practice and academic obstetricians attending on labor and delivery Total providers/ staff formally trained: NR**Specialty:** NR | **Mode of birth Vaginal, spontaneous:**NR**Vaginal, assisted:**NR Cesarean birth, %:Total:1986: 27.31987-1990: NR\*1991: 16.9EP/BL: *P* < 0.0001 Primary:1986: 18.21987-1990: NR\*1991: 10.6 EP/BL: *P* < 0.0001Repeat:1986: 9.11987-1990: NR\*1991: 6.4 EP/BL: *P* < 0.0001**Maternal outcomesMaternal mortality:** NR**Neonatal outcomes Neonatal mortality, n (%):**1986: 44 (1.0)1987: 29 (0.7)1988: 28 (0.6)1989: 24 (0.5)1990: 16 (0.3)1991: 18 (0.4)**Apgar score, 5 minutes, n (%):**≤ 3:1986: 20 (0.4)1987: 23 (0.5)1988: 18 (0.4)1989: 21 (0.5)1990: 19 (0.4)1991: 15 (0.3)< 7:1986: 98 (2.2)1987: 107 (2.5)1988: 93 (2.1)1989: 73 (1.6)1990: 75 (1.5) |
| Socol et al., 1993 (continued) |  |  | 1991: 3,364 (72.0) |  | 1991: 84 (1.8)**NICU admission, n (%):**1986: 441 (10.3)1987: 373 (8.7)1988: 417 (9.6)1989: 497 (11.2)1990: 454 (9.3)1991: 457 (9.7) |

1 Data provided for all years, statistical comparisons between 1986 and 1991.

\* Results only displayed graphically.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Studnicki et al., 1997Country:USSystem:FloridaBaseline period: 1990 to 1992Evaluation period: 1990 to 1993Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:State passed a law in 1991 requiring the Department of Health and Rehabilitative Services to adopt rules to establish practice parameters in provider hospitals. Provider hospitals (defined as having 30 or more births per year fully paid by state or federal funds) required to provide copies of guidelines to staff credentialed to perform cesarean section deliveries, establish peer review board to review cesareans, incorporate peer review into hospital quality assurance monitoring. Guidelines comprised of fetal evaluation, definitions of labor and labor diagnosis. | Inclusion criteria:* Medical discharge data DRG codes 370-375 obtained from nonfederal acute care hospitals in Florida

Exclusion criteria: * See inclusion criteria
 | Births, n:1990: 187,054 1991: 182,896 1992: 182,385 Baseline period: 552,3351993: 183,291**Medicaid:** NR**Private insurance coverage:** NRPrior cesarean, n (%):1990: 22,064 (11.8)1991: 21,655 (11.8)1992: 22,938 (12.6)Baseline period: 66,657 (12.1)1993: 23,127 (12.6) | Total providers/ staff: NRTotal providers/ staff formally trained: Obstetricians**Specialty:**NR | **Mode of birth Vaginal, spontaneous:** NRVaginal, assisted:NRCesarean births, n (%):1 Total:1990: 49,543 (26.5) 1991: 46,176 (25.2) 1992: 45,793 (25.1) Baseline period: 141,512 (25.6)1993: 44,082 (24.1) Primary:1990: 32,295 (17.3) 1991: 30,061 (16.4) 1992: 28,988 (15.9) Baseline period: 91,344 (16.5) 1993: 28,106 (15.3) Repeat:1990: 17,248 (9.2) 1991: 16,115 (8.8) 1992: 16,805 (9.2) Baseline period: 50,168 (9.1) 1993: 15,976 (8.7)**Maternal outcomes** **Maternal mortality:** NR**Neonatal outcomes Neonatal mortality,** NR**Apgar scores:**NR**NICU admissions:**NR |

1 The authors report cesarean rates among all women, women with a prior cesarean, and women without a prior cesarean for each quarter in the study.

| **Evidence Table C2. Strategies to reduce cesarean birth—systems-level interventions (continued)** |
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| **Study Description** | **Intervention & Population** | **Inclusion & Exclusion Criteria** | **Clinical Population** | **Provider****Population** | **Outcomes** |
| Author:Tay et al., 1992Country:SingaporeSystem:Singapore General HospitalBaseline period:1987Evaluation period: 1988 to 1990Funding: NRAuthor industry relationship disclosure: NR**Design:**Pre-post assessment | Cesarean reduction intervention:Critical review of indications for cesarean delivery. Departmental audit of all cesareans. | Inclusion criteria: NRExclusion criteria: NR | Births, n: 1987: 3,1561988: 4,6581989: 3,8231990: 5,238Parous, %: Primaparae:1987: NR1988: NR1989: 521990: NR**Medicaid:** Not applicable**Private insurance coverage:** Not applicable | Total providers/ staff: NRTotal providers/ staff formally trained: NR**Specialty:**NR | **Mode of birth Vaginal, spontaneous, n (%):** 1987: 2,244 (71.1)1988: 3,667 (78.7)1989: 2,759 (72.2)1990: 3,787 (72.5)Vaginal, assisted, n (%):1987: 525 (16.6)1988: 473 (10.2)1989: 634 (16.6)1990: 835 (15.9)Cesarean birth, n (%):1987: 387 (12.3)1988: 518 (11.1)1989: 430 (11.2)1990: 616 (11.7)**Maternal outcomesMaternal mortality:** NR**Neonatal outcomes** Perinatal mortality, rate per 1000 births:> 500 grams: 1987: 8.251988: 7.051989: 9.391990: 5.83> 1000 grams: 1987: 7.581988: 5.771989: 6.251990: 4.89Apgar scores:NRNICU admission:NR |